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SUBMARINE DISMANTLING PROJECT

Strategic Environmental Assessment (SEA): Environmental Report

Issue 1.0 – October 2011

de&s SUBMARINES

Defence Infrastructure Organisation

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Document Information

Project Name:	Submarine Dismantling Project		
Document Title:	Strategic Environmental Assessment – Environmental Report		
Issue Status:	Issue 1.0	**Deliverable Reference:**	
Produced By:	Amec Environment & Infrastructure	**Level of Control:**	This Document is controlled to Level 1 iaw SDP PMP Document Quality Management Procedure. At each level the Document must be Approved and Authorised.

Document Authorisation

Owner:	[redacted]	**Peer Reviewer**	
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Document Approver:	[redacted]	**Approver's Signature:**	e-signed
Document Authoriser:	[redacted]	**Authoriser's Signature:**	

Document Revisions

No.	**Details**	**Date**
1.0	Version 1 (issued)	21 Oct 2011

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Submarine Dismantling Project

Strategic Environmental Assessment: Environmental Report

October 2011

AMEC E&I UK Limited

Report for

In-Service Submarines
Defence Equipment and Support
Ministry of Defence

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Doc Reg No. 25271rr062i3

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Certificate No. FS 13881 Certificate No. EMS 69090

Contents

Preface to the Environmental Report

This is the Environmental Report for the Strategic Environmental Assessment (SEA) of the Submarine Dismantling Project. This report, alongside its Non-Technical Summary, has been produced as part of the SDP Public Consultation. We would like your views on the approach we have taken, and on the findings of the assessment.

The SEA has found that of the numerous options put forward for submarine dismantling, few have potentially significant positive or negative environmental effects; those identified are largely related to the size of development for new facilities. The proposed solutions that the MOD is putting forward in the SDP public consultation have been found to have no likely significant environmental effects.

The SEA highlights a wide range of smaller, less significant positive and negative effects across the options; this report describes them, and details the measures that should be taken to enhance the beneficial effects and avoid or minimise the negative effects.

The findings of the SEA have been integrated into the options analysis for the SDP as it has developed, to ensure that environmental issues have been properly taken into account in developing the proposals now being put forward in the Public Consultation.

Throughout the development of the SDP, the MOD will continue to consider environmental issues as an integral part of its decision making process.

1. Introduction

1.1 The Submarine Dismantling Project

The Submarine Dismantling Project (SDP), formerly known as the Interim Storage of Laid-Up Submarines (ISOLUS) project, was established in 2000 to deliver a timely and cost-effective solution for the dismantling of the UK's defuelled, nuclear-powered submarines at the end of their life. The stated aim of the SDP is to ensure that the implementation of any solution is safe, environmentally responsible, secure, cost-effective and inspires public confidence. In May 2009, the project formerly changed its name from ISOLUS to the Submarine Dismantling Project (SDP) to more accurately reflect the scope of work proposed.

The project, which extends over a 60 year period, encompasses the provision of facilities, personnel and processes to dismantle the 27 defuelled nuclear powered submarines (of past and currently in-service classes[1]). The activities involved in the dismantling project will include:

- the development and operation of the initial submarine dismantling facilities required to remove the radioactive materials from the submarines;
- the development and operation of interim Intermediate Level radioactive Waste (ILW) storage facilities;
- the technical options for removing the radioactive materials from the submarines;
- the processing-related operations, including the transport and management of the submarines, ship recycling and management of the resulting waste streams, including ILW and Low Level Waste (LLW), hazardous wastes and inert materials; and
- the eventual decommissioning of all facilities, when no longer required.

Recognising the importance that public confidence would play in the development of any solution, Ministerial commitments were made that public consultation would be undertaken before any major decisions are made. Two Public Consultations on the project have been held to date (see http://www.MOD.uk/DefenceInternet/MicroSite/DES/OurPublications/SDP/Document+Archive/ for further information).

The third Public Consultation is on the proposed options for the SDP. The public consultation is, in particular, seeking views on options for the following:

- how the radioactive material is removed from the submarines;
- where the radioactive material is removed from the submarines; and
- which type of site is used to store the ILW until the proposed GDF becomes available to the SDP.

[1] The new Astute class, currently being brought into service, and the next planned class of submarine (known as 'Sucessor') are not part of the SDP. However the project is required, where possible, to retain flexibility for future classes – namely to retain options for adapting or life-extending dismantling facilities, should such decisions be taken in future.

This Strategic Environmental Assessment (SEA) Environmental Report supports the public consultation by providing information on the potential environmental effects of the project and its options.

1.2 Strategic Environmental Assessment (SEA)

SEA became a statutory requirement following the adoption of European Union Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. This was transposed into UK legislation on the 20 July 2004 as *Statutory Instrument No.1633 - The Environmental Assessment of Plans and Programmes Regulations 2004*. The objective of SEA, as defined in Directive 2001/42/EC is:

'To provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to contributing to sustainable development'.

Throughout the course of the development of a plan or programme, the SEA should seek to identify, describe and evaluate the likely significant effects on the environment of implementing the plan or programme and to propose measures to avoid, manage or mitigate any significant adverse effects and to enhance any beneficial effects. The main requirements and stages of the SEA are:

- setting the context and objectives, establishing the baseline and deciding on the scope in consultation with the SEA statutory consultees (Stage A);
- developing and refining alternatives, assessing the likely direct, indirect and cumulative effects of the proposed options and identifying mitigating and monitoring measures (Stage B);
- completing an Environmental Report to present the predicted environmental effects of the plan or programme, including alternatives, in a form suitable for public consultation and use by decision-makers (Stage C);
- consulting on the draft plan or programme and the Environmental Report (Stage D);
- assessing the environmental implications of any significant changes to the draft plan or programme (Stage D);
- providing information in a Post Adoption Statement on how the Environmental Report and consultees' opinions were taken into account in deciding the final form of the plan or programme to be adopted (Stage D); and
- undertaking periodic monitoring of the associated impacts of the selected options (Stage E).

Although the strict applicability of the SEA Regulations to the SDP remains unclear, the MOD is committed to undertaking an environmental assessment incorporating the requirements of the SEA Directive on the SDP proposals, as this is considered to be good practice. This precautionary position helps ensure that potential environmental implications of the proposals are assessed up-front and hence available to inform the decision making process. The approach will follow both MOD[2] and wider

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[2] The Environmental and Sustainability Appraisal Tool Handbook (Chapter Two: SEA) MOD, 2006. http://www.MOD.uk/DefenceInternet/AboutDefence/CorporatePublications/DefenceEstateandEnvironmentPublications/DefenceEstates/SustainabiltyAndEnvironmentalAppraisalToolHandbook.htm

government[3] guidance and is consistent with the statutory SEA requirements.

1.3 Purpose of this Report

The purpose of this SEA Environmental Report is to:

- present relevant environmental baseline information, including other relevant plans and programmes;
- identify, describe and assess the significant potential environmental impacts associated with the different SDP options (and comment on socio-economic matters where relevant);
- propose measures to avoid, reduce and/or offset any potentially significant adverse effects and, where appropriate, to enhance any potential positive effects from the adoption of the SDP options;
- outline and describe the measures envisaged for monitoring any significant effects identified by the Environmental Report;
- provide sufficient information to those affected so that the SDP achieves its stated aims with respect to public consultation and stakeholder engagement; and
- enable the MOD to demonstrate that the SDP proposals have been developed in a manner consistent with the requirements of the SEA Regulations.

After the third Public Consultation has finished, the MOD has the opportunity to consider the significant environmental effects identified by the SEA and to adopt the proposed mitigation measures as part of the proposals it takes forward.

1.3.1 Applying SEA to the SDP

The Submarine Dismantling Project is (for the purposes of SEA) a national programme which consists of seven broad, strategic stages (see Figure 1.1).

[3] A Practical Guide to the Strategic Environmental Assessment Directive. ODPM (now the Department for Communities and Local Government), 2006. http://www.communities.gov.uk/publications/planningandbuilding/practicalguidesea).

Figure 1.1 Key Indicative Stages and Activities of the SDP (may overlap or coincide)

I	Design and develop the initial submarine dismantling facilities, and
II	Design and develop the interim ILW storage facilities
III	Dock submarines and remove the radioactive materials
IV	Dismantle and recycle the residual submarine hulls; process waste
V	Transport RC/ RPV / packaged waste to interim storage
VI	Size reduce the RC/ RPV (if required); transfer packaged waste to the GDF
VII	Decommission the SDP facilities

- **Stages I and II** (development of dismantling and interim ILW storage capabilities) relate to land use, and involve a number of generic site options. <u>The MOD is consulting on where to develop the initial dismantling facility, and on which type of site to develop the ILW storage facility</u>.
- **Stage III** (removing the radioactive materials) has no land use element, but involves three possible technical options with associated environmental considerations. <u>The MOD is consulting on which technical option to adopt.</u>
- **Stages IV** (processing residual hulls), **V** (movement of ILW to interim storage) and **VI** (dismantling the RC/ RPV and moving the ILW to the proposed GDF) will all include a number of transport options.
- **Stage VII** (decommissioning SDP facilities) will be purely generic in nature.

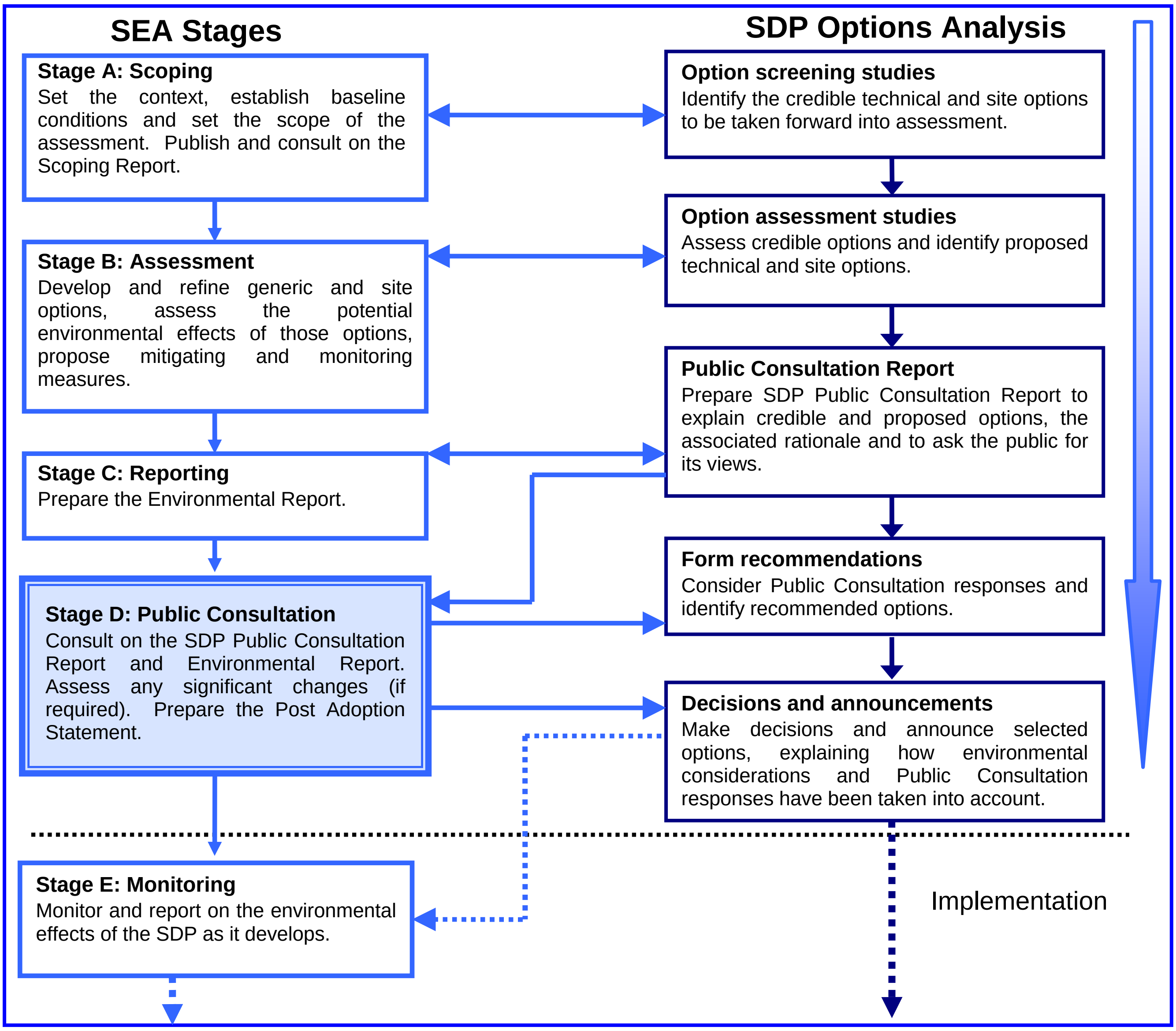
The SEA firstly assesses the likely significant environmental effects associated with each of these seven stages, at a generic level. This includes *generic* site options for the initial dismantling and ILW storage facilities, as well as consideration of the technical options for removing the radioactive materials from the submarines.

The generic assessment is followed by an assessment of 15 integrated SEA options, combining the *site-specific* options for initial dismantling site, the technical options for removing the radioactive materials and the potential *types of site* for interim ILW storage.

Finally, the SEA assesses the possible cumulative effects that undertaking initial dismantling at the named sites could have in combination with other proposed and consented developments in the area.

Figure 1.2 provides an overview of how the SEA has informed the development of the SDP proposals which are now being consulted on.

Figure 1.2 Overview of the SEA Process within the Context of the SDP

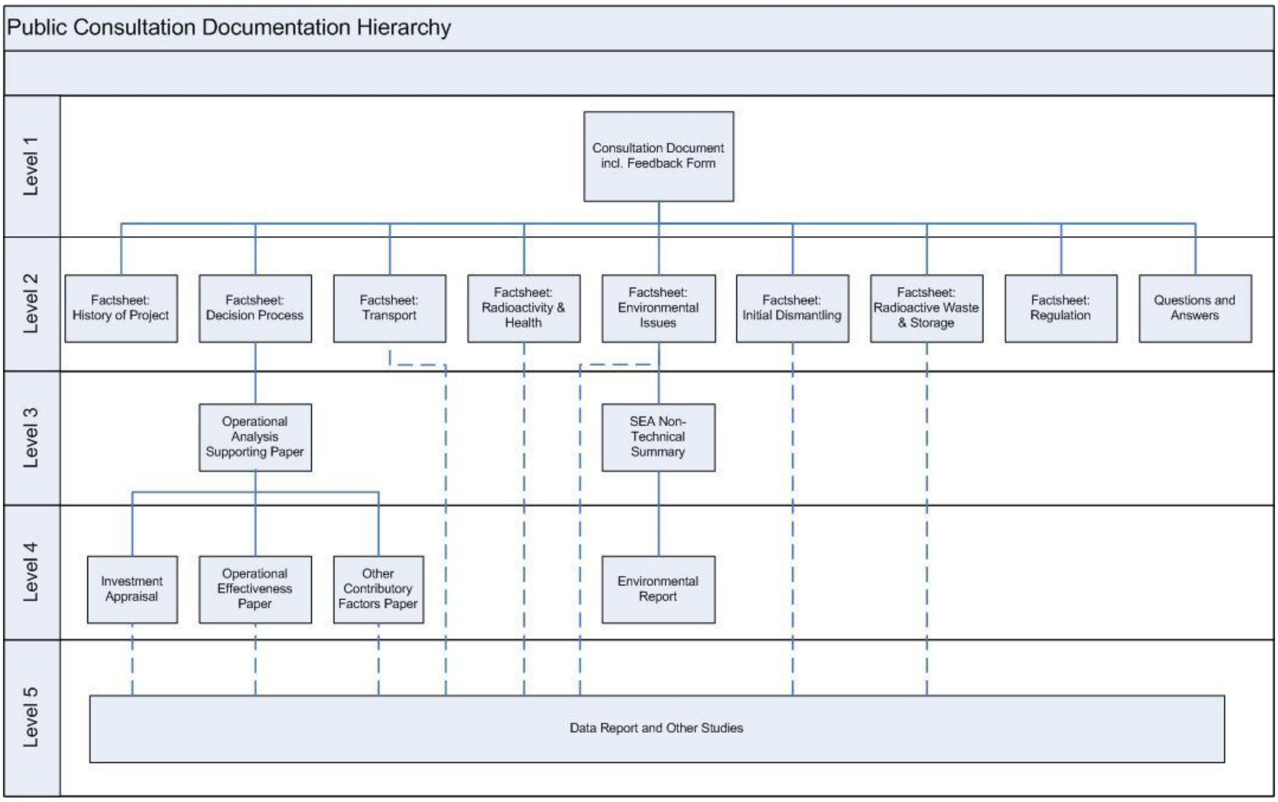


This assessment is strategic in nature. Whilst it will consider potential candidate sites for removing the radioactive materials from the submarines, it does not constitute a detailed site-level assessment. Following decisions on the proposed way forward, site-specific issues will be addressed through the consenting process for individual developments. This may include Environmental Impact Assessments associated with Town and Country Planning and nuclear decommissioning, Environmental Permitting, and/or Habitats Regulation Assessment, as appropriate.

1.4 Document Hierarchy

The SEA forms part of the SDP Public Consultation Document Hierarchy (**Figure 1.3**).

Figure 1.3 Public Consultation Document Hierarchy



The Non-Technical Summary summarises the findings of the Environmental Report in a simple and clear format, which is accessible and understandable to the general public as its target audience. It has been kept separate to the main Environmental Report.

This Environmental Report, which is a far more complex document, is designed to be a stand-alone report that explains the SDP, details the SEA process and how it has been applied, and presents the findings of the environmental assessments undertaken on both the generic stages of the SDP and on the Integrated Options that have been considered in forming the MOD's proposals. It is written to be easily understandable to professional readers such as Statutory Bodies, Regulators and NGOs, who understand technical terminology and environmental principles. Notwithstanding this, the main report contains a full glossary and care has been taken to make the language and layout as assessable to the public as the technical nature of the report allows.

Appendix A to the Main Report is a purely technical document, written in necessarily technical language. It contains all of the detailed assessments, structured by SEA topic. As required by the SEA Regulations, each section contains an introduction, summary of plans and programmes, the environmental baseline, existing problems, assessment objective and guide questions; and the detailed assessments. It is aimed at fulfilling the likely requirements of Statutory Bodies, other Government Departments and Agencies, and Regulatory bodies.

The draft **Habitats Regulation Assessment** (detailed in 1.6 below) is also a highly technical assessment to fulfil detailed statutory requirements.

1.5 Structure of this Report

This Environmental Report is structured as follows:

Section 1: Introduction (pp 1-16)
Includes a summary of the SDP, an overview of the assessment's scope, report contents and an outline of how to respond to the consultation.

Section 2: The Submarine Dismantling Project (pp 17-28)
Outlines the SDP and its strategic objectives

Section 3: SEA Methodology (pp 29-40)
Provides a brief commentary on:

- the current and projected baseline information used in the assessment (at national, regional and sub-regional level);
- the relevant plans or programmes at international, national, regional and sub-regional level, and their relationship with the SDP; and
- the proposed SEA objectives and guide questions, how effects have been assessed, the assumptions used and any technical difficulties encountered in completing the assessment.

Section 4: Assessment of Compatibility (pp 41-46)

This compares the objectives of the SDP against the assessment objectives of the SEA, to check for any conflicts.

Section 5: Assessment of the Generic Stages of the SDP (pp 47-84)

Summarises the potential environmental effects associated with each generic stage of the SDP, including comparative assessments of different land types and the technical options for removing the radioactive materials from the submarines

Section 6: Assessment of Integrated Options (pp 95-130)

Summarises the potential environmental effects associated with the 15 integrated SEA options (including named sites for initial dismantling), and the cumulative effects of the SDP proposals in conjunction with other infrastructure proposals and plans in and around the candidate sites.

Section 7: Conclusions and Key Findings (pp 131-146)

Provides overall conclusions of the assessment, proposals for monitoring, details the next steps in the assessment process and a completed quality assurance table.

Abbreviations and Glossary

Appendix A: Topic Chapters and Detailed Assessment (Separate document)

To meet SEA requirements, this report should identify, describe and evaluate the likely significant effects on the environment of implementing the SDP and the reasonable alternatives (taking into account the objectives and the geographical scope of the plan or programme). The specific information required for the Environmental Report is set out in Schedule 2 to the SEA Regulations. **Table 1.1** (below) details how we have addressed these requirements in this report.

Table 1.1 How SEA Information Requirements have been addressed in this Environmental Report

SEA Information Requirements	Environmental Report Reference
1. An outline of the contents and main objectives of the plan or programme, and of its relationship with other relevant plans and programmes.	Addressed in **Section 2** and **Appendix A.**
2. The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme.	Addressed in **Appendix A.**
3. The environmental characteristics of areas likely to be significantly affected.	Addressed in **Appendix A.**
4. Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Council Directive 79/409/EEC on the conservation of wild birds[4] and Council Directive 92/43/EEC (the Habitats Directive[5]).	Addressed in **Section 5** and **6** and **Appendix A.** It will be further reported on in the draft Habitats Regulations Assessment.
5. The environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation.	Addressed in Appendix A **(for all topics).**
6. The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects, on issues such as: biodiversity; population; human health; fauna; flora; water; air; climatic factors; material assets; cultural heritage, including architectural and archaeological heritage; landscape; and the inter-relationship between the issues referred to in sub-paragraphs (a) to (l).	Addressed in **Section 4, 5** and **6** and Appendix A **(all topics)**. **Section 6.8** provides specific information on the cumulative effects of the proposals. All these effects are summarised at the end of each section and in **Section 7.** A separate Habitats Regulations Assessment has also been completed which also identifies any potential effects on European designated conservation sites.

[4] Council Directive 79/409/EEC on the conservation of wild birds. The Directive provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. In the UK, the provisions of the Birds Directive are implemented through the Wildlife and Countryside Act 1981 (as amended) and The Conservation (Natural Habitats, andc.) Regulations 1994 (as amended).

[5] Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (EC Habitats Directive). In the UK the Directive has been transposed into national laws by means of the Conservation (Natural Habitats, and c.) Regulations 1994 (as amended). The 'Habitats Regulations' apply to the UK land area and its territorial sea (to 12 nautical miles from the coast), and are supported by government policy guidance.

SEA Information Requirements	Environmental Report Reference
7. The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme.	This is addressed in **Section 5** and **6** and Appendix A **(all topics)**. These are summarised in **Section 7** and in the **NTS**. In broad terms the 'mitigation hierarchy' has been applied. In many cases, effects will be so site specific that environmental measures and mitigations can only be meaningfully determined through the later tiers of environmental assessment such as Environmental Impact Assessment and project specific Habitats Regulations Assessment.
8. An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.	The alternatives proposals considered to address the SDP's purpose are presented **in Section 2**, **5** and **6**. A description of the how the assessment was undertaken including any difficulties is presented in **Section 3**.
9. A description of the measures envisaged concerning monitoring of environmental conditions	This requirement is addressed in **Section 7.3**. It will be revised following consultation and form an element of the Post Adoption Statement, produced at (or as soon as is practical after) the adoption of the final proposals for the SDP
10. A non-technical summary of the information provided under paragraphs 1 to 9.	A Non-Technical Summary accompanies this Environmental Report.

1.6 Habitats Regulations Assessment

The Defence Infrastructure Organisation as the relevant Competent Authority has assessed the SDP in accordance with the requirements of the EC Habitats Directive (92/43/EEC) and transposing Regulations. Consultation was undertaken with the appropriate designated nature conservation bodies.

In consequence, it was determined that the SDP is subject to Habitats Regulations Assessment (HRA) at Plan level, since a number of European Designated sites could potentially be affected by the SDP.

The findings of the SEA and HRA have been used to inform each other, to ensure consistency of approach and conclusions. The findings of the HRA have been reflected in the SEA assessment, under the biodiversity objective.

The Draft HRA has now been produced; it will be formally consulted upon with the relevant Statutory Authorities during the period of public consultation. It can be found at www.mod.uk/submarinedismantling.

HRAs may also be required at individual project level, once consultations have been completed and strategic decisions have been made.

1.7 Consultation and Stakeholder Engagement

1.7.1 Overview

Consultation is fundamental to the SEA process and reflects the principle that lies at the heart of the SEA process – that plan and programme making is better where it is transparent, inclusive and uses information that has been subject to public scrutiny. The SEA process seeks to ensure that the people who could be affected or who have an interest have the opportunity to present their views on the SDP proposals.

1.7.2 Scoping Consultation

The Scoping consultation provided an opportunity for UK Statutory Consultation Bodies (as identified in the SEA Regulations) and selected non-statutory consultees to comment on the proposed scope and level of the SEA. The 'scoping consultees' that the MOD has consulted with are identified below.

Box 1.1 SEA Scoping Consultees	
SEA Statutory Consultees	The Environment Agency English Heritage Natural England Department of the Environment's Environment and Heritage Service (Northern Ireland) Historic Scotland Scottish Environment Protection Agency Scottish Natural Heritage Cadw (Welsh Government historic environment service) Countryside Council for Wales Scottish Government Welsh Government
Non-Statutory Consultees	Department of Communities and Local Government (CLG) Department of Energy and Climate Change (DECC) Department of Environment, Food and Rural Affairs (Defra) Department of Health (DoH) Department for Transport (DfT) Health Protection Agency (HPA) Nuclear Decommissioning Authority (NDA) Office for Nuclear Regulation

There were two rounds of scoping consultation undertaken as the SDP proposals evolved.

The First (Generic) Scoping Report Consultation - Stage 'A1'

This was undertaken between June 17th and July 23rd, 2010. All nine Statutory Bodies provided responses, as did the Scottish Government. Of the eight other relevant Government Departments and Agencies invited to participate, four did so (Defra, DfT, HPA and the NDA).

The key points raised by the first consultation are shown in **Table 1.2** below, structured according to the questions posed in the Stage 'A1' generic scoping report. The full 'A1' report can be found at www.mod.uk/submarine dismantling.

Table 1.2 Overview of Issues Raised in the First Stage of Scoping Consultation

Question	Summary of Consultee Responses
Do you have any comments on the proposed alternative options outlined for the SDP?	Most respondents were generally content with the scope of the alternatives presented. Questions were tabled about why 'greenfield,' 'brownfield' and 'existing Licensed/ Authorised' sites were chosen as generic site categories, and there was some confusion about whether these effectively formed site selection criteria. Several respondents suggested that the scope should consider different ship-recycling options or sites. Comments were also received about the importance of using existing facilities where possible to minimise environmental impact.
Do you agree with the main environmental issues identified?	Respondents generally agreed that all relevant environmental issues were captured by the report, although there was some confusion between the aims and content of Sections 3 (baseline issues) and 5 (scoping of potential effects). More emphasis was requested on certain areas, such as management of non-radiological wastes, risks from invasive species, outdoor access opportunities and the effects of dredging. It was suggested that the environmental categories be re-ordered to give a single focus for coastal change, flooding and climate change risks.
Are there additional plans, programmes and strategies which should be considered in the SEA?	It was generally noted that the Scoping Report gave insufficient consideration to the plans, programmes, policies and environmental protection objectives of the UK's Devolved Administrations. Several respondents requested clarification about the applicability of Habitats Regulations Assessment to the SDP at strategic (Plan) level. DECC highlighted that the proposed NDA Strategy should be included, as it includes consideration of non-NDA liabilities such as MOD wastes.
Do you know of any additional baseline evidence which will help to inform the SEA process?	A range of baseline data was suggested to help target the assessment; the majority concerned the devolved administrations. Respondents wished to see site-specific data in the updated scoping report.
Do you agree that the proposed SEA objectives cover the breadth of issues appropriate for assessing the SDP?	There was one substantive change to the SEA objectives proposed, regarding flood risk and coastal change. Suggestions were made to amend or create additional assessment questions across a number of areas, including landscape, public access, waste management and land use.
When and how should we be seeking your opinions on site-specific information?	Most respondents agreed that the two-stage approach to scoping, whereby the report is updated when potentially credible sites are identified, was reasonable. The importance of including undeveloped 'greenfield ' and previously-developed 'brownfield' land in the SEA, and hence avoiding restriction of alternatives to 'credible' existing Licensed/Authorised sites only, was also made. Several consultees indicated a preference for including credible civil ship-recycling sites in the assessment of options for the non-radiological parts of the submarines. DECC later highlighted that the draft NDA Strategy (which closed to public consultation on 24 Nov 10) explored the potential opportunities to share current and planned storage facilities to improve value for money and reduce the environmental impact of new store build. The development of such a national waste consolidation strategy represents a significant opportunity for MOD to realise better value for money in conjunction with wider government liabilities, but was not sufficiently mature to support the screening of potential candidate sites.
Do you have any further suggestions regarding the proposed approach to SEA?	A wide range of comments were received on this section, all of which will help shape the MOD's approach to undertaking the SEA. Details can be found at Appendix F of the 'A2' report.

The Second (Updated) Scoping Report Consultation – Stage 'A2'

The second Scoping Report included the named sites identified as candidates for removing the radioactive materials, under a separate site selection process.[6]. The second phase of consultation was undertaken between December 6th 2010 and January 24th 2011.

The headline changes that were made to the second (Stage 'A2') Scoping report in response to the comments received were as follows:

- The inclusion of National baseline information (including devolved plans, programmes etc where relevant) for Wales, Scotland and Northern Ireland. This is important to ensure that all areas of the United Kingdom are given equal consideration by the SEA during the generic assessment.

- The restructuring of the assessment categories to include an additional section on Coastal Change and Flood Risk. This focuses this important issue in one area, and replaced disparate (and overlapping) references to flooding, coastal erosion and climate change risks in the other assessment categories.

- The clarification of the definitions for the generic land types upon which SDP facilities could be developed.

Two workshops were held In support of the consultation, one in Scotland on the 10th January 2011 and one in England on the 11th January 2011. Representatives of SEPA, SNH, HS and the NDA attended the workshop in Scotland; representatives of the EA and HPA attended the workshop in England.

Seven of the nine Statutory Bodies provided written responses, along with the Scottish Government. Of the eight other relevant Government Departments and Agencies invited to participate, four did so (Defra, HPA, DoH and the ONR). A response was also received from Plymouth City Council.

The key points raised by the second consultation are shown in **Table 1.3** below, structured according to the questions posed in the Stage 'A1' generic scoping report. The full 'A2' report can be found at www.mod.uk/submarine dismantling.

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[6] An explanation of the indicative site selection process can be found in the document *SDP - Our approach to decision making,* February 2011 on the SDP web-site, http://www.MOD.uk/DefenceInternet/MicroSite/DES/WhatWeDo/SDP/

Table 1.3 Overview of Issues Raised in the Second Stage of Scoping Consultation

Question	Summary of Consultee Responses
Do you have any further comments on the revised approach to undertaken the SEA?	Respondents confirmed that the revised scope and approach presented in the updated Scoping Report was acceptable. No further topics were proposed; however, each Statutory Body emphasised an interest in the topics for which they are responsible and sought reassurance that these would be treated appropriately within the assessment. For example, the Environment Agency emphasised the importance of the waste management hierarchy, water quality, water resource management, flood risk and climate change. CCW sought clarification of aspects to be included under some of the topics and encouraged greater consideration of natural processes, functions and ecological services that contribute to biodiversity. Considerable interest was expressed in the approach to cumulative assessment and the need to ensure that the assessment of the potential impacts of the SDP take into consideration other likely infrastructure projects in the vicinity of the candidate sites. In the workshop, SNH emphasised the importance of considering potential effects on European designated conservation sites that were beyond the 20km radius used (due to the need to considering any effects on migratory species).
Do you agree with the revised national baseline information?	Respondents were generally content that relevant national baseline information was presented in the Scoping Report and in the Appendix. Respondents took the opportunity to propose additional baseline or trend information as appropriate and the final scoping report now contains additional updated information on: • Hazardous waste quantities and trends. • Health. • Air quality, climate change and biodiversity information for Northern Ireland.
Do you agree with the additional sub-regional baseline information?	Respondents were generally content that the sub-regional baseline information was presented in the Scoping Report and in Annex C was relevant. Respondents accepted the request for additional information and provided additional baseline information on • Cultural heritage for Devonport. • The Marine Conservation Zone for Plymouth Sound. • Flood risk assessments for Rosyth. Plymouth City Council provided links to updated baseline information for the area. The EA raised a potential concern regarding the implication of comparing a baseline for Fife, a large county with Plymouth much smaller land area which could skew the assessment outcomes. The EA also noted that adjacent administrative areas were not included in the baseline assessment.
Are there additional plans, programmes and strategies which should be considered in the SEA?	Respondents were generally content that relevant plans and programme information was presented in the Scoping Report and in Annex B. Additional plans and programmes highlighted for inclusion were: • Flood and Water Management Act 2010. • Specific River Basin Management Plans. • Specific Coastal Management Plans. • Specific Water Resource Management Plans. • UK Strategy for the Management of Solid Low Level Radioactive Waste. • The proposed NDA Strategy 2010. • Scotland's Higher Activity Radioactive Waste Policy 2011. • Noise Policy Statement. • WHO Night Noise guidelines.
Do you agree that the proposed SEA objectives cover the breadth of issues appropriate for assessing the SDP?	There were no substantive changes to the SEA objectives proposed, although minor amendments were suggested for a limited number of the guide questions.

The changes that were made to the final Scoping report in response to the comments received were as follows:

- inclusion of the consultee proposed additional national and sub-regional baseline information for health, noise, air quality, water and waste;
- inclusion of the consultee proposed additional plans and programmes;
- minor amendments to the generic identification of the potential significant environmental issues to be scoped into the assessment; and
- minor amendments to the example mitigation measures

The final Scoping Report can be found on the SDP website at www.mod.uk/submarinedismantling

1.7.3 Public Consultation on this Environmental Report

This Environmental Report is being issued for public consultation as an integral part of the SDP public consultation, which takes place between **October 28th 2011** and **February 17th 2012.** In addition to seeking views from the public, this report has been sent directly to the UK Statutory Bodies identified in **Box 1.1** and all other government departments and agencies invited to participate in the Scoping consultation.

Copies of the Environmental Report, Non-Technical Summary, SDP Public Consultation Document and all supporting information are available electronically from www.mod.uk/submarinedismantling. Details of how to respond to the consultation are overleaf.

This Consultation: How to Give Us Your Views

We would welcome your views on the Environmental Report and Non-Technical Summary. We are particularly interested to receive your views on the following questions:

1. **Do you think that the environmental report has captured the significant environmental effects of the SDP?** If not, what potential effects do you think we have missed, and why?
2. **Is there any other baseline of environmental information, relevant to the SEA, that we have not included?** If so, please provide details.
3. **Do you agree with the proposed arrangements for monitoring significant effects of the SDP options, detailed in the Environmental Report?** If not, what measures do you propose?
4. **Do you agree with the conclusions of the Report and the recommendations for avoiding, reducing or off-setting significant effects of the SDP options?** If not, what do you think should be the key recommendations and why?

These questions are included in the SDP consultation proposals, of which this environmental report is a part. Copies of both documents are available electronically from www.mod.uk/submarinedismantling

Please provide your comments by **February 17th 2012**. Comments should be sent to:

Post: FREEPOST RSKJ-KRAH-YZRJ
Submarine Dismantling Project
C/o Green Issues Communications Ltd
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Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information regimes (these are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 (DPA) and the Environmental Information Regulations 2004).

If you want information that you provide to be treated as confidential, please be aware that, under the FOIA, there is a statutory Code of Practice with which public authorities must comply and which deals, amongst other things, with obligations of confidence.

In view of this it would be helpful if you could explain to us why you regard the information you have provided as confidential. If MOD receives a request for disclosure of the information, it will take full account of your explanation, but cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department.

The Department will process your personal data in accordance with the DPA and in the majority of circumstances this will mean that your personal data will not be disclosed to third parties.

2. The Submarine Dismantling Project

2.1 Overview

When a nuclear-powered submarine leaves service with the Royal Navy, a process known as De-fuel, De-equip and Lay-Up Preparation (DDLP) is undertaken. The reactor is defuelled, and the fuel is sent for long-term storage at the Nuclear Decommissioning Authority (NDA) site at Sellafield, Cumbria. Serviceable equipment is taken away and reused, and the submarine is then laid up for long-term afloat storage. This is conducted as soon as possible, but is dependant on the availability of suitable docks and facilities.

To date, 17 nuclear powered submarines have left naval service. Currently, the only UK submarine dockyard licensed to remove used fuel is the Babcock site at Devonport Dockyard in Devon. Upgraded facilities are currently being built there, and are planned to come into service over the next few years. Of the ten submarines stored at Devonport, six await defuelling. Until 2004, submarines were also defuelled at Rosyth in Scotland, and seven submarines remain afloat there.

The majority of the radioactivity in a working submarine is in the fuel. Once defuelled, the majority of the remaining radioactivity is in irradiated steel in the 50-80 tonne Reactor Pressure Vessel (RPV), the metal container which housed the fuel. These components have become radioactive by use over time. The RPV is contained securely within the Reactor Compartment (RC). The design of both the RC and RPV includes shielding to protect submariners from radiation during operation. These same internal safety barriers ensure that the submarine is safe to be stored afloat for a prolonged period.

Submarines displace between 5,000 and 16,000 tonnes, depending on Class, with the ‘Vanguard’ Class submarines the largest of the fleet. Of this, the Reactor Compartment typically weighs around 700 tonnes (around 1,000 tonnes in ‘Vanguard’ Class).

Whilst afloat storage has proved to be a very safe arrangement for over 30 years, it no longer fulfils MOD[7] or wider Government[8] policies, which require that nuclear decommissioning and disposal operations should be carried out “as soon as reasonably practicable.” There are also issues of public perception, and of afloat storage capacity at Devonport, which is expected to be reached around 2020. The cost of maintaining the laid-up submarines and conducting unplanned remedial work is increasing as they age, and this situation is not sustainable in the long term.

In 1998, approval was given to proceed with an in-house study into options for the interim storage of nuclear submarines following their withdrawal from service. The resulting ISOLUS Investigation Concept Phase Report[9] recommended that a land storage strategy for the Intermediate Level Waste contained within the Reactor Compartments was the most viable option and should be pursued. In May 2000, the recommendations of the study were accepted and Project ISOLUS was formally established. The project gained ‘Initial Gate’ approval in 2002, and is currently in its Assessment Phase. SEA Scoping

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[7] “MOD policy for decommissioning and the disposal of radioactive waste and residual nuclear material arising from the nuclear programme”, issued 9 Oct 07.

[8] Govt policy framework: Managing Radioactive Waste Safely (MRWS), DEFRA and Devolved Administrations, 2001. ‘Managing the nuclear legacy – a strategy for action.’ DTI, 2002. The Decommissioning of the UK Nuclear Industry’s Facilities – Amendment to Command 2919. DTI, 2004.MRWS White Paper – A Framework for Implementing Geological Disposal. 2008.

[9] The ISOLUS Investigation Concept Phase Report, issued 26 May 1999

began in May 2009. At that time, the project was formally re-titled the Submarine Dismantling Project (SDP) to better reflect the nature of the project.

2.1.1 Aim and Scope of the SDP

The overall aim of the Submarine Dismantling Project (SDP) is to deliver a timely and cost-effective solution for the dismantling of the UK's defuelled nuclear-powered submarines which is safe, environmentally responsible, secure, cost-effective and inspires confidence. The project will provide an alternative to the continued afloat storage of the defuelled submarines, and will include recovery and recycling of materials and the eventual disposal of the Intermediate Level Waste (ILW) to the proposed UK ILW disposal facility, referred to in this report as the proposed Geological Disposal Facility, or GDF.[10] Until the proposed GDF is able to accept the ILW from the submarines, it will have to be safely stored. This element is known as 'interim storage.'

The scope of the SDP, which extends over a 60 year period, encompasses the following:

- provision of facilities and expertise to dismantle the Royal Navy's 27 nuclear submarines (of past and current classes[11]) once defuelled, re-using and recycling as much material as possible;
- provision of interim, land-based storage for the resulting ILW until at least 2040, pending the availability of the proposed GDF; and
- the eventual decommissioning of the dismantling and storage facilities used in this process.

In general terms, dismantling a laid-up submarine will include the following key activities.

- **Removing radioactive materials:** Radioactive materials will be removed from the submarines. These materials are classified as Intermediate Level Waste (ILW), as Low Level Waste (LLW) or as very Low Level Waste (vLLW). *A description of these terms can be found in the glossary at the back of this document.* The ILW will be made ready for storage, whilst the LLW will be taken, in accordance with the established UK LLW strategy, to a licensed storage/ disposal facility (such as the UK LLW repository in Cumbria). Where possible, the LLW will be processed further to remove and recycle uncontaminated materials, so reducing the amount that would need to be disposed of. The vLLW only contains trace amounts of radioactivity, and can generally be managed through conventional waste streams.
- **Interim storage:** The ILW does not have a current disposal route, so will have to be placed into safe interim storage within the United Kingdom until the proposed GDF becomes available to the SDP, some time after 2040.

[10] Details of the GDF programme can be found at http://mrws.decc.gov.uk/en/mrws/cms/home/What_is_geolog/What_is_geolog.aspx. Note that the Scottish Government position differs from the UK government position and is that of 'near site, near surface' long-term storage. Further information can be found at http://www.scotland.gov.uk/Topics/Environment/waste-and-pollution/Waste-1/16293/higheractivitywastepolicy.

[11] 6x 'Superb' Class; 7x 'Trafalgar' Class; 2x 'Valiant' Class; 3x 'Churchill' Class; HMS Dreadnought; 4x 'Resolution' Class; 4x 'Vanguard' Class. The scope of the SDP does not include disposal of Astute class or successor to the Vanguard Class submarines; however the project is required, where possible, to retain flexibility for future classes (namely to preserve options for adapting or life-extending dismantling facilities, should such decisions be taken in the future).

- **Ship recycling:** with the radioactive material removed, the remainder of the submarine hull can then be transported to a suitably-licensed conventional UK ship recycling facility, where the hull will be broken up and dealt with in accordance with the UK Ship Recycling Strategy. This is the way in which the MOD's redundant surface ships are already broken up and recycled.

The project will involve developing facilities to undertake the initial dismantling, and, if needed, to store the ILW. It will also involve transporting submarine hulls and waste materials, and eventually decommissioning and disposing of the facilities, once no longer required.

Before decisions are made about how to go about this, the MOD is publicly consulting on options for the following:

- how the radioactive material is removed from the submarines;
- where the radioactive material is removed from the submarines; and
- which type of site is used to store the ILW until the proposed GDF becomes available to the SDP.

There are a number of potential options for each of these issues, and the SEA provides information on the potential environmental, social and health-related effects for each option.

The principles of the SDP are that:

- continued afloat storage (known as the 'do minimum' option) is not a reasonable long term solution, due to both MOD and wider Government decommissioning policies, together with storage capacity constraints and long-term cost;
- the redundant submarines cannot be dismantled or disposed of abroad, for security reasons;
- all submarines will already have been defuelled before they undergo dismantling, so there will be no nuclear fuel nor any associated High Level Waste (HLW) to deal with;
- the proposed GDF is not expected to be available until at least 2040, which means that some form of interim ILW storage will be necessary;
- all dismantling work on radioactive elements of the submarines must take place at a site that holds an appropriate civil nuclear Licence (whether this is at a new or an existing facility);
- much of the radiological work involved in dismantling (e.g. work involving radioactive materials) is already established practice in submarine refits and in decommissioning nuclear power stations, so there will be very few new technical procedures involved;
- the bulk of each submarine would not have to be dismantled at a nuclear Licensed site as it would not contain any radioactive components, and, once cleared for release, could be handled at an existing commercial ship-recycling facility, to make the best use of existing expertise and to give better value for money;
- where possible, non-radioactive materials will be re-used or recycled (rather than be disposed of); and
- the principles of legal compliance, adopting industry good practice, openness and transparency will be applied to the project.

2.1.2 Public Consultation on the SDP

Recognising the importance that public confidence plays in the development of the solution, a process of public consultation has been undertaken as the project has developed. Two public consultations on the SDP have been held to date:

- **Front End Consultation (FEC):** This consultation in 2001[12] was to identify what members of the public and other stakeholders considered should be taken into account when developing a solution.
- **Consultation on ISOLUS Outline Proposals (CIOP)**: In 2003, four industry groups submitted outline proposals to meet the ISOLUS/SDP requirement to the MOD[13.] These formed the subject of the CIOP, and generated a degree of interest and controversy. The CIOP report was published in May 2004; MOD's response was released through the then Minister for Defence Procurement in Feb 2005[14], following extensive consultation with Other Government Departments and Devolved Administrations.

A key CIOP recommendation was that ISOLUS should be aligned with the process of the Committee on Radioactive Waste Management (CoRWM), set up by Government in November 2003 as an independent body to recommend a strategy for the long term management of the UK's legacy higher-activity solid radioactive waste. Work on identifying potential interim ILW storage sites was suspended, in order to achieve a cohesive cross-Government approach to radioactive waste management. CoRWM's report was issued in July 2006[15]; Government and Devolved Administrations responded in October 2006[16].

As part of a package of recommendations, CoRWM recommended geological disposal coupled with a programme of robust, safe and secure interim storage, until a higher-activity waste disposal facility is available. This fitted well with the strategic aims of the SDP. As a result, the MOD was able to continue developing the strategies for processing submarines and interim storage of the resultant ILW.

2.2 Key Stages, Activities and Options of the SDP

The SDP consists of a number of generic stages, which are broadly sequential, but which may overlap or coincide, depending on the technical options chosen. Whilst the public consultation concentrates on the specific issues detailed in 2.1.1 above, it has been necessary to assess every aspect of the SDP in the SEA, to ensure that all the potential environmental impacts occurring throughout the project are identified, and so can be properly managed. These generic 'stages' are shown below. *Note that adherence to Statutory requirements throughout the project is assumed in this report.*

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[12] See http://www.submarinedismantling.co.uk/assets/downloads/publicconsultation/ISOLUS_consultation_report.pdf
[13]See http://www.submarinedismantling.co.uk/ConsultationCOIP.asp
[14] Min(DP)'s statement in response to the Consultation on ISOLUS Outline Proposals (CIOP), Feb 05. http://www.submarinedismantling.co.uk/assets/downloads/documentlibrary/CONSULTATION-OUTLINE-2003/02/isolus-ciop-MOD-responses.pdf
[15] Managing our Radioactive Waste Safely, CoRWM's recommendations to Government, 31/07/06, http://www.corwm.org.uk/Pages/Lnk_pages/key_issues.aspx
[16] Response to the Report and Recommendations from the Committee on Radioactive Waste Management (CoRWM), By the UK Government and he devolved administrations, 25 October 2006. http://www.corwm.org.uk/Pages/Lnk_pages/key_issues.aspx

- **Stage I: Design and develop the initial submarine dismantling facilities** - This involves providing the means (essentially the facilities, processes and personnel) to safely dock the defuelled submarines and remove the radioactive materials.

- **Stage II: Design and develop the interim ILW storage facilities** - This involves providing the means (the facilities, processes and personnel) to safely store the ILW, until such time as the proposed GDF becomes available to the SDP.

- **Stage III: Dock submarines and remove the radioactive material** - This involves docking the defuelled submarines into the dismantling facility before removing and processing the radioactive material, in accordance with industry good practice.

- **Stage IV: Dismantle the residual submarine hulls and process wastes** - This involves recovering re-useable components and then taking the rest of each submarine apart in accordance with appropriate industry good practice, producing recyclable and non-recyclable waste streams. To make the best use of existing skills and to maximise value for money, the residual submarine hulls would be transported to an established commercial ship recycling facility in the UK, since (unlike the radioactive materials) these sections do not need to be processed at a Nuclear Licensed or Authorised site. Low Level Waste would be taken away to a licensed disposal facility, and very Low Level Waste would, once cleared, be handled in conventional waste streams.

- **Stage V: Transport RC/ RPV/ Packaged Waste to interim storage** - This involves transporting the ILW from the dismantling facility/ies to interim storage. The types of transport used to move the ILW will depend upon the size of the packages, the location(s) of the dismantling and storage facilities and the availability of suitable transport infrastructure.

- **Stage VI: Size reduce the Reactor Compartment/ Reactor Pressure Vessel (if required); transfer packaged ILW to the proposed GDF -** If the RPV is cut apart ('size reduced') to packaged waste at Stage III, this stage will solely involve transporting the containers to the proposed GDF. If, however, initial dismantling at Stage III involves separation of the RC or removal of the RPV, this Stage will see these components being size reduced to Packaged Waste before being transported to the proposed GDF.

- **Stage VII: Decommission the SDP facilities** - This involves safely decommissioning the dismantling and interim storage facilities, and returning them to a condition that is consistent with any proposed future use. For the purposes of the SEA, it has been assumed that this would be back to their original condition.

2.3 Applying SEA to each generic SDP stage

This section describes how the SEA has been applied to the generic stages of the SDP described above.

2.3.1 Stage I: Develop Facilities to remove the Radioactive Waste from the Submarines and Stage II: Develop Facilities to store the ILW

Both initial dismantling and interim ILW storage will need to take place somewhere in the UK on one, or more, sites. In their broadest sense, these sites fall into one of the following three categories:

- **Undeveloped, 'greenfield' sites**. These would be new sites developed on land that has not previously been developed, such as farmland or parkland, or which has been abandoned after historic use and has reverted to a 'natural' state - such as a disused quarry or mine workings. At a site on such land, there would be no existing dock, or ship handling facility, nuclear License or expertise to undertake the required work; most or all the required infrastructure would need to be developed from scratch.

- **Previously-developed, 'brownfield' sites**. These would be new sites developed on land that is or has been developed and occupied by buildings or infrastructure. It is assumed that there would be some existing infrastructure in place (such as a dockside, hard-standing and a road system), but that some infrastructure (such as a dry dock) and ancillary facilities would be needed. There would be no nuclear facilities or qualified personnel available. Commercial ship recycling facilities without a nuclear License would fall into this category.

- **'Existing,' Nuclear-Licensed and/ or Authorised sites**. These are developed sites where specific nuclear activities have been Licensed or Authorised[17] by the UK nuclear regulators, and where current nuclear expertise exists. Ideally, there should be sufficient existing infrastructure in place, such as a dry dock to accommodate the submarines, and radioactive waste handling facilities. Within this category, there are three generic site types: Licensed and Authorised sites owned by the MOD, Licensed sites owned by the UK Nuclear Decommissioning Authority (NDA) and Licensed sites owned by commercial operators.

The generic site categories have evolved from the basic distinctions of using an existing Licensed/ Authorised nuclear site, versus developing a new site. The 'new site' category intuitively divides itself into building on land which is not built up ('greenfield' sites), and building on already developed or derelict land (brownfield sites)

Since there are an almost unlimited number of 'undeveloped' and 'previously-developed' sites available in the UK, it was considered disproportionate in relation to the scale of the project to consider each one individually, unless the possibilities for using an existing nuclear licensed or authorised site are exhausted. This conclusion is supported by the findings of the earlier public consultations[18] and in comments received from the Environment Agency during the Scoping Consultation.

The SEA has therefore assessed the potential environmental effects of developing initial submarine dismantling facilities and interim ILW storage facilities on these three generic land types. The results have been used to inform the site selection process[19], and the results are shown in Sections 5.2 and 5.3, respectively.

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[17] It is important to note that it is the undertaking of the nuclear activity per se, rather than the site itself, that is approved, although the term "Authorised/ Licensed site" is commonly used.

[18] Project ISOLUS, Front End Consultation, Final Report, September 2001 and Project ISOLUS, Consultation on Outline Proposals, Final Report, September 2001. Both reports can be viewed at www.submarinedismantling.co.uk

[19] An explanation of the indicative site selection process can be found in the document *SDP - Our approach to decision making,* February 2011 on the SDP web-site, http://www.MOD.uk/DefenceInternet/MicroSite/DES/WhatWeDo/SDP/

Stage I: Initial Submarine Dismantling Facilities

There are only a small number of 'existing' nuclear Licensed or Authorised sites in the United Kingdom[20] and only some of these could undertake submarine dismantling in practice - for example, sites would need direct access to the sea, so those sites not on the coast would not be feasible. The MOD therefore considered it reasonable to identify and name those sites, and to assess the environmental effects of undertaking SDP activities there, especially since the location of the dismantling site(s) will be a determining factor in the nature and scale of effects on EU-designated sites.

An indicative list of the potential candidate 'existing' Licensed/Authorised sites was developed using operational criteria derived from the project's Key User Requirements. The process of identifying these sites has been completed.[21]. The list of these candidate sites can be found in **Table 2.**1 below.

Table 2.1 Candidate Sites for initial submarine dismantling

Site	Location	Owner
Devonport Dockyard Rosyth Dockyard	Plymouth, England. Fife, Scotland.	Babcock International Group

The submarines could all be dismantled at one of these sites, or dismantled 'in situ' at both sites (this is known as the 'dual site' option).

Stage II: Interim ILW storage facilities

An interim storage facility will be needed to hold the ILW safely until the proposed GDF can accept it. The SEA has therefore firstly assessed the environmental effects of developing ILW storage facilities on different types of site: Undeveloped 'greenfield' land, previously developed 'brownfield' land, or on 'existing' Licensed or Authorised sites, owned by MOD, the Nuclear Decommissioning Authority (NDA) or Commercial operators.

It has not yet been appropriate to identify any individual sites, because of the different contexts and developing strategies affecting different types of site. For example, the NDA is in the process of exploring opportunities to share its current and planned storage facilities to improve value for money and reduce environmental impact of new store build. Such a development in the NDA's strategy would be a key consideration in any site screening exercise. Commercial sites, meanwhile, would need to be screened through a commercial process inviting expressions of interest from site owners.

At this stage, therefore, MOD has assessed the different types of 'existing', licensed or Authorised ILW storage site that could be used (e.g. those owned by MOD, NDA or commercial operators). These could

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[20] See http://www.hse.gov.uk/nuclear/licensees/pubregister.pdf for the full list
[21] SDP Site Criteria and Screening Paper – available on the SDP website (http://www.MOD.uk/DefenceInternet/MicroSite/DES/OurPublications/SDP/MOD+Studies/)

be at/ close to where initial dismantling takes place (known as the 'point of waste generation'), or somewhere 'remote' from it. The SEA focuses on comparing, in broad terms, 'point of generation' sites with 'remote' sites.

However, it is already known that Reactor Compartments are too big and heavy to be transported over any distance by road or rail, so can only be moved by sea and these effects are considered in the generic assessment. The MOD has not assessed storing the RCs at sites 'remote' from the initial dismantling site(s) at Rosyth and/or Devonport, because the additional costs associated with sea transport and dockside handling would make moving them into storage at a different site uneconomic.[22]

Summary

In summary, the SEA **firstly** considers the generic environmental effects associated with developing the initial dismantling *and* interim ILW storage capabilities at undeveloped, previously-developed and 'existing' Licensed/ Authorised sites. **Secondly**, the SEA will then consider the environmental effects associated with developing initial dismantling facilities at Devonport and/or Rosyth – the two 'existing' Licensed/ Authorised sites that are reasonably able to accommodate SDP activity. The SEA also assesses the significant environmental effects of developing ILW storage facilities at/ close to the point of waste generation and at a 'remote' site in the UK.

2.3.2 Stage III: Dock Submarines and remove the Radioactive Materials

Stage III entails moving and docking the defuelled submarines into the initial dismantling facility/ies, and removing the remaining radioactive material. Unless the submarines are dismantled *in situ* at Devonport and Rosyth, it follows that some of the submarines will need to be transported by sea to the dismantling facility.

The extent to which each Reactor Compartment is taken apart will determine what form the resulting radioactive waste will be in, and hence affect the design and size of the interim store. Three such 'technical options' have been considered:

i. **Separate the Reactor Compartment**. This would involve removing the Reactor Compartment intact from each submarine hull. Each RC weighs between 700 and 1000 tonnes and is around 10 metres in diameter and 7 metres long. It would be taken out of the dry dock and the now separated front and rear sections would be taken away and dismantled using standard commercial ship recycling processes. The RC would be stored intact on land until the proposed GDF becomes available to the SDP at some point after 2040. Only at that point would the RC be size reduced into smaller pieces and the ILW packaged for transport and disposal to the proposed GDF.

   Low Level Waste (LLW) would be managed in accordance with the UK's LLW Policy and transported to a Licensed facility (such as the National LLW Repository in Cumbria), where uncontaminated materials would be separated to minimise the amount of LLW to be disposed of. Very low-level radioactive waste (vLLW) has sufficiently low levels of radioactivity that it can be classified as exempt waste and can be cleared for recycling or re-use.

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[22] For more details, see the SDP Site Criteria and Screening Paper – available on the SDP website (http://www.MOD.uk/DefenceInternet/MicroSite/DES/OurPublications/SDP/MOD+Studies/

ii. **Remove the Reactor Pressure Vessel.** This would involve cutting into the Reactor Compartment and extracting the RPV via a hole cut in the hull, leaving the submarine in one piece. Each RPV weighs between 50 and 80 tonnes (depending on Class), is around 4 metres long and is 3-4 metres wide and deep. Any other ILW (such as pipes in the primary circuit) would also be removed, and the RPV would then be stored intact until the proposed GDF becomes available to the SDP. If necessary, the stored RPV would be size reduced and packaged into $3m^3$ containers for disposal.

Low Level Waste would again be taken to a licensed facility and processed to separate out any uncontaminated recyclable materials. The remainder of the submarine would be transported to a UK ship recycling facility for complete dismantling and recycling.

iii. **Remove and size reduce the Reactor Pressure Vessel to Packaged Waste.** This would involve removing the RPV from the submarine and then size reducing it before immobilising the now smaller pieces of metallic ILW inside approved, GDF-compliant containers. Again, the submarine would be left intact, and no further size reduction or packaging would be needed prior to disposal. The LLW would again be packaged and transported to a licensed disposal facility, and the remainder of the submarine would be taken away for recycling elsewhere in the UK.

The size and design requirements for the interim ILW storage facility will depend largely on which of these technical options is adopted. A facility of approximately $11{,}600m^2$ will be needed to store 27 intact Reactor Compartments. By contrast, a much smaller facility of approximately $800m^2$ will be needed to store the Reactor Pressure Vessels, and storing the Packaged Waste will need around $1000m^2$.

Irrespective of the technical option chosen, the reactor will need to be dismantled and packaged *before* the ILW can be accepted into the proposed GDF. Therefore, the most significant difference between these options is <u>when</u> the reactor will be dismantled and the ILW packaged. Storing either the RC or the RPV intact would defer the point at which this is done until the proposed GDF becomes available to the SDP, some time after 2040. The design of the proposed GDF is not yet finalised and, if plans change, it may be possible to dispose of the RPV whole, without size reduction. However, this is by no means certain, and the SEA has been conducted on the adopted project assumption that RPVs would have to be size-reduced to Packaged Waste prior to disposal.

The scope of the SDP (and hence the SEA) does <u>not</u> extend to that of the spent nuclear fuel, as this is removed from the submarines at Devonport before the submarines enter long-term storage, and is stored at the fuel Repository at Sellafield. Note that spent fuels are not formally classified as waste, since they could be re-used in the future.

2.3.3 Stage IV: Dismantle the Residual Submarine Hulls and Process Wastes

Once the radioactive materials have been removed to the satisfaction of the Regulator, the residual submarine hulls (or hull sections if the RCs are removed intact) will be given clearance to be released off-site as conventional waste. It is proposed that dismantling of the residual hulls will be undertaken at an existing commercial ship-recycling facility elsewhere in the UK, as this would make best use of existing ship recycling expertise, would bring significant cost benefits to the project, and is standard practice for the MOD's surface ships when they reach the end of their lives.

The SEA assesses the generic impacts of ship-recycling and managing the resulting waste streams.

However, the scope does not extend to a comparative assessment of individual commercial ship-recycling sites, since the commercial arrangements for ship recycling will not be decided upon until after the strategic decisions have been made by Ministers. These are established facilities whose activities are licensed to ensure appropriate environmental standards are met; it is not considered reasonable or necessary to assess any alternatives to such well-established standards.

2.3.4 Stage V: Transport the RC/RPV/Packaged ILW to interim storage

The best form(s) of transport for the radioactive waste streams will be largely determined by the physical form of the waste (e.g. whether as an intact RC, removed RPV or as Packaged Waste) and by the physical characteristics and transport links of the processing and storage site(s). It is already known that off-site transport of intact RCs is only feasible by sea, as they are too large to travel any distance by road or rail. The MOD has not assessed storing the RCs at sites 'remote' from the initial dismantling site(s) at Rosyth and/or Devonport, because the additional costs associated with sea transport and dockside handling would make moving them into storage at a different site uneconomic. [23]

The SEA assesses the generic impacts of transporting the RC, RPV or packaged ILW by road, rail and sea/ river, as appropriate. Site-specific impacts are also considered in relation to the feasible transport links associated with proposed dismantling sites.

2.3.5 Stage VI: Size reduce RC/ RPV (if required); transfer packaged ILW to the proposed Geological Disposal Facility

Once the proposed GDF is operational and able to accept ILW from submarines, the ILW will need to be transported to it in compliant packaging. If the RCs are taken apart and size reduced to Packaged Waste 'up-front,' no more work will be needed, and this stage will only involve transporting the packages from interim storage to the proposed GDF. If, however, the RCs or RPVs are stored intact, further size reduction and /or packaging will be required before the ILW can be sent for disposal.

The generic environmental impacts associated with dismantling stored RCs or RPVs at some point in the future are covered by Stage III, as the processes and issues will be very similar. Any significant differences between the environmental impacts of 'early' and 'late' size reduction to packaged waste are highlighted.

The generic impacts associated with transporting the Packaged Waste are covered by Stage V, as the processes and issues are very similar.

Note that, although reference is made to the proposed GDF, the environmental issues associated with its development are subject to separate assessment process by the NDA and so are outside the scope of the SDP.

2.3.6 Stage VII: Decommission SDP facilities

The project plan sees submarine processing facility/ies being operational until around 2046, with interim

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[23] For more details, see the SDP Site Criteria and Screening Paper – available on the SDP website (http://www.MOD.uk/DefenceInternet/MicroSite/DES/OurPublications/SDP/MOD+Studies/

ILW storage being needed until at least 2040. Since decommissioning is so far in the future, there are significant uncertainties about the nature and magnitude of the possible environmental effects associated with decommissioning of the facilities.

The SEA assesses the generic impacts of decommissioning, using evidence gained from the civil nuclear industry. However, it does not include any site-specific assessment, as anything more than a generic assessment at this stage would not be meaningful.

2.4 Summary

The way in which SEA has been applied to the SDP at both generic and site-specific level is summarised in **Table 2.2**.

The SEA firstly considers the generic environmental effects that could arise at each stage of the SDP. This assessment is followed by a determination of site-specific effects that could arise from removing the radioactive materials from the submarines at Devonport and/ or Rosyth dockyards.

Table 2.2 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The Generic Assessment will assess the effects of…	The Site Specific Assessment will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; or – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV and packaging the ILW.	• Developing initial dismantling facilities for all three technical options at Rosyth and Devonport
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land; or – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.	• Developing interim storage facilities for all three technical options: – At the point of waste generation; – At a 'remote' Licensed/ Authorised site (owned by MOD, Commercial operators or the NDA).
Stage III Dock Submarines and Remove the Radioactive Materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form	• Transporting the submarines from their current storage sites (if required). • Undertaking initial dismantling at Rosyth and/ or Devonport.

Key Stages	The Generic Assessment will assess the effects of…	The Site Specific Assessment will assess the effects of…
	Packaged Waste.	
Stage IV Dismantle the residual submarine hulls and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.	• Transporting the residual hulls from Rosyth and/ or Devonport to a commercial ship recycling facility.
Stage V Transport the RC/RPV/ ILW to Interim Storage	• Transporting the ILW to interim storage.	• Transporting the ILW from the point of waste generation (e.g. Rosyth and/ or Devonport).
Stage VI Size reduce RC/ RPV (if appropriate); Transfer packaged ILW to proposed GDF	• Size reducing the RC or RPV to packaged waste (if the ILW was stored in this way). • Transporting the packaged waste to the proposed GDF.	N/A; assessed at Stage III
Stage VII Decommission SDP Facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land use: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).	• Decommissioning SDP facilities at Rosyth and/ or Devonport

The assessment of specific sites will clearly contain more detail than the generic assessments, since site information will be available. Whichever site(s) are eventually chosen, further site-specific environmental assessments will be needed before any development can take place. These may include Town and Country Planning Environmental Impact Assessment, Environmental Impact Assessment for Nuclear Decommissioning and Environmental Permitting[24].

These choices are presented within the context that indefinite afloat storage of redundant submarines (the 'do minimum' option) is not a reasonable long-term solution for the United Kingdom. As a result, this 'do minimum' option has been assessed as a baseline comparator in the SEA, although it is not considered as a 'reasonable alternative' in its own right.

[24] The Town and Country Planning (Environmental Impact Assessment) (Amendment) (England) Regulations 2008, and their devolved equivalent in Wales, Scotland and Northern Ireland; the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999; The Conservation of Habitats and Species Regulations 2010; the Environmental Permitting Regulations 2010 in England and Wales; the Radioactive Substances Act 1993 for Scotland and Northern Ireland.

3. SEA Methodology

3.1 Overview

This section sets out how the SEA has been carried out. This includes when the SEA was undertaken and by whom (**Section 3.1**), the scope of the assessment and the topics considered (**Section 3.2**), the baseline information used (**Section 3.3**), the assessment objectives (**Section 3.4**) and the approach taken to completing the assessment (**Section 3.5**). Technical difficulties encountered during the assessment are also summarised (**Section 3.6**).

This SEA of the SDP proposals was undertaken in 2011 by sustainability and technical consultants at AMEC, with input from the MOD. The findings presented in this Environmental Report will be issued to statutory and non-statutory consultees and the public as part of the third SDP Public Consultation, taking place between October 2011 and February 2012.

3.2 Scope of the Assessment

The scope of this assessment reflects the potential environmental effects of the SDP. **Section 3.2.1** sets out the core topics required for consideration by the SEA Directive and their relationship with the SDP. **Section 3.2.2** sets out the geographic scope of the SEA.

3.2.1 Environmental categories included in the Scope of the Assessment

The range of potential environmental effects under consideration has been informed primarily by the SEA Directive and Regulations, using published government guidance[25]. Schedule 2 of the SEA Regulation requires that the assessment includes information on the "*likely significant effects on the environment, including on issues such as: biodiversity; population; human health; fauna; flora; soil; water; air; climatic factors; material assets; cultural heritage, including architectural and archaeological heritage; landscape; and the inter-relationship between the issues referred to*". These environmental categories have been used throughout this report, supported by additional category information taken from the MOD Sustainability and Environmental Appraisal Tools Handbook (2009).

In the absence of detailed guidance on their content, a number of these environmental categories (e.g. population, human health and material assets) can be subject to varying interpretation. Within this report:

- 'population' includes information on demographics and generic social and socio-economic issues;
- 'human health' includes information on mortality, illness and indices of perceived well-being; and
- 'material assets' includes information on transport, waste management, land use and materials.

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[25] Office of the Deputy Prime Minister (2005). A Practical Guide to the Strategic Environmental Assessment Directive.

The SEA does not address wider socio-economic issues that are outside the scope of the SEA Regulations in detail. However, the public consultation documentation (of which this Environmental Report is a part) explains how socio-economic issues are considered. If required, further socio-economic assessment will be undertaken as appropriate to support Ministerial decision-making after public consultation.

Table 3.1 shows how the categories in this report reflect those in the SEA Regulations.

Table 3.1 Effects Considered by the SEA

Categories in the SEA Regulations	Categories used in the SDP SEA
Biodiversity, Flora and Fauna	Biodiversity and Nature Conservation
Population	Population including socio-economic effects
Human Health	Human Health and Wellbeing Health (Noise and Vibration)
Soil	Soil and Geology
Water	Water
Air	Air
Climatic factors	Climate Change and Energy Use Coastal Change and Flood Risk
Material assets	Transport Waste Management Land Use and Materials
Cultural heritage, including architectural and archaeological heritage	Cultural heritage, including architectural and archaeological heritage
Landscape	Landscape and Townscape

3.2.2 Geographic scope of the Assessment

The SEA firstly considers the generic environmental effects associated with each stage of the SDP and addresses the question of whether there is a preferable land use category from the broad options of 'greenfield,' 'brownfield' and 'existing' Licensed/ Authorised site. This assessment has been followed by a determination of the site-specific effects that could arise from initial submarine dismantling (removing the radioactive materials from the submarines) at the 'existing' nuclear Licensed or Authorised sites at Devonport and Rosyth.

To ensure comprehensive geographic coverage of the potential effects, two tiers of contextual information have been collated; one at national level (UK, England, Scotland, Wales and Northern Ireland) and the other at the sub-regional, or Local Authority, level for both sites (Plymouth for Devonport, and Fife for Rosyth).

It is recognised that purely relying on the Local Authority the candidate site is located in to provide a common geographic basis to gather information may unintentionally exclude other areas close to the site that could be affected. So, where appropriate, sub-regional baseline information has been supplemented by additional datasets to cover areas within discrete distances of the candidate sites.

Notwithstanding this, the SEA is strategic, and does not assess the detailed site-specific issues in the same degree of detail that would typically be required at the Planning stage for individual developments.

3.2.3 Short, Medium and Long-Term Timescales

When considering the timing of potential effects of the SDP, the commentary classifies effects as 'short,' 'medium' or 'long term.' These are defined by the anticipated operational lifetime of the dismantling programme itself (i.e. approximately 27 years). Using this as the basis, 'short term' is interpreted as between 0 and 5 years, 'medium term' as more than 5 and no more than 27 years and 'long term' as over 27 years.

3.3 Context and Baseline

3.3.1 Review of Plans and Programmes

The SEA Regulation requires a review of the SDP's "*relationship with other relevant plans and programmes*". One of the first steps in undertaking the SEA is to identify and review other relevant plans, programmes, policies and strategies (herein after referred to as 'plans and programmes') that could influence the SDP proposals. These may be plans and programmes at an international/ European, national, regional or sub-regional level, as relevant to the scope of the SDP. The summary within each topic section in Appendix A identifies the relationships between the SDP and these other documents; i.e. how the SDP proposals could be affected by the other plans' and programmes' aims, objectives and/or targets, or how it could contribute to the achievement of any environmental and sustainability objectives and targets set out in these plans and programmes.

The review of plans and programmes also helped complete the environmental baseline and help determine the key issues. The review also provided the policy context for the assessment.

3.3.2 Collecting Baseline Evidence

An essential part of the SEA process is to identify the current state of the environment and its likely evolution under a 'business as usual' scenario. Only with sufficient knowledge of the existing baseline conditions can the likely significant effects of the SDP proposals be identified and assessed. The SEA also requires that the actual effects of implementing the SDP on baseline conditions are monitored.

All the environmental topics listed in the SEA Regulations have been found to be relevant for the SDP (see **Table 3.1**). These were consulted upon at the scoping stage and have been amended to reflect the views of the Statutory Consultees.

Appendix A (under separate cover) sets out the following information, on a topic-by-topic basis, for each of the 14 assessment categories:

- relevant aspects of the current state of the environment;
- the likely evolution of these baseline conditions without the implementation of the SDP;

- the environmental characteristics of areas likely to be significantly affected; and
- current problems in areas of particular environmental importance (such as those designated under the Wild Birds and Habitats Directives).

Information has been used from a variety of sources, including (amongst others) Defra, DECC, the Environment Agency, Natural England, the Office of National Statistics, Welsh Government, the Scottish Environment Protection Agency and the Northern Ireland Environment Agency.

3.4 SEA Objectives and Guide Questions

Establishing appropriate objectives and guide questions is central to assessing the effects of the SDP on the environment.

The SEA objectives have been based on existing MOD guidance, incorporating appropriate SDP-specific issues. Broadly, the objectives present the preferred environmental outcome which usually involves minimising detrimental effects and enhancing positive effects.

The associated guide questions (shown in **Table 3.2** below) have been developed for each SEA objective to provide a detailed framework against which the SDP proposals can be assessed. Both the objectives and guide questions have been revised to reflect comments received by the statutory consultees during Scoping.

A general assumption that underpins the SEA objectives is that all existing legal requirements will always be met. As a result, statutory compliance has not been treated as a separate issue in either the objectives or guide questions.

Table 3.2 SEA Categories, Objectives and Guide Questions

Assessment Category and Overall Objective	Assessment Guide Questions *Will the SDP Proposals…*
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems.	Affect animals or plants, including protected species? Affect designated nature conservation sites? Affect the structure and function of natural systems (ecosystems)? Affect public access to areas of wildlife interest? Have an impact on fisheries?
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts.	Affect the social infrastructure and amenities available to local communities? Affect local population demographics and/ or levels of deprivation in surrounding areas? Affect opportunities for investment, education and skills development? Affect the number or types of jobs available in local economies? Affect how diverse and robust local economies are? Affect the sense of positive self-image and the attractiveness of surrounding areas as places to live, work and invest in?

Assessment Category and Overall Objective	Assessment Guide Questions *Will the SDP Proposals…*
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.	Affect the health or safety of SDP workers, or other people working at the proposed sites? Affect the health, safety and well-being of local communities? Affect local healthcare infrastructure and provision?
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration.	Significantly increase levels of noise and vibration? Affect the amount of noise and vibration felt by local communities?
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources.	Have an effect on soil quality, variety, extent and/or compaction levels? Have an effect on soil function and processes? Increase the risk of significant soil contamination? Have an effect on any known and existing contamination? Affect geological conservation sites and important geological features? Affect land stability?
F. Water Maximise water efficiency, protect and enhance water quality.	Affect demand for water resources? Affect the amount of waste water and surface runoff produced? Cause any changes in radioactive or other hazardous discharges to water? Affect the quality of groundwater, surface waters or sea water? Affect the distribution and quality of freshwater or marine sediments?
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality	Affect air quality? Cause a change in radioactive emissions to air? Affect emissions of ozone-depleting substances? Create a nuisance for people or wildlife (for example from dust or odours)?
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.	Affect the amount of carbon dioxide and other greenhouse gases emitted? Be significantly affected by climate change (for example rising temperatures and more extreme weather events)? Affect how climate change might impact on the wider environment? Promote or impede the use of energy efficiency measures, low carbon and/ or renewable energy sources? Have wider implications for combating the effects of climate change?
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities.	Affect existing flood risks? Be at risk of flooding from any source? Affect coastal processes and/or erosion rates? Be affected by coastal processes and/or erosion?

Assessment Category and Overall Objective	Assessment Guide Questions *Will the SDP Proposals…*
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.	Affect the number and frequency of heavy, oversized, radioactive and/ or hazardous loads being transported off-site, particularly through sensitive areas (e.g. population centres, historic areas and vulnerable ecosystems?) Increase or decrease traffic congestion around SDP sites? Increase or decrease the risk of traffic accidents around SDP sites?
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities.	Increase the amount of radioactive waste to be disposed of? Affect the amount of hazardous waste to be disposed of? Affect the amount of non-hazardous wastes produced? Affect the capacity of existing waste management systems, both nationally and locally? Maximise re-use and recycling of recovered components and materials? Help achieve government and national targets for minimising, recovering and recycling waste? Affect the environmental risks associated with managing radioactive and hazardous wastes?
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	Change patterns of land use on or around SDP sites? Affect any existing or proposed redevelopment/regeneration programmes? Lead to the loss of undeveloped land or green spaces? Increase the burden on limited natural resources such as aggregates or wood? Promote the use of sustainable design and construction practices and help the government achieve its targets for the quality of built environments? Make best use of existing infrastructure and resources?
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features.	Affect designated or locally-important archaeological features? Affect the fabric and setting of historic buildings, places or spaces that contribute to local distinctiveness, character and appearances?
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity.	Have significant visual impacts (including those at night)? Affect protected/designated landscapes or townscapes, such as National Parks or Conservation Areas? Affect the intrinsic character of local landscapes or townscapes? Affect public access to open spaces or the countryside?

3.5 Completing the Assessment

This assessment has been undertaken on a topic-by-topic basis, with the SDP options tested against the SEA objectives and guide questions in **Table 3.2**. The detailed assessments are presented in **Appendix A,** and summarised in **Section 4, 5** and **6** of this report.

3.5.1 Prediction and Evaluation of Effects

In line with the ODPM (now CLG) *Practical Guide to the SEA Directive*[26], the assessment process seeks to *predict the significant environmental effects of the plan or programme.* This is done by identifying the likely changes to the baseline conditions as a result of the implementing the option. These changes are described (where possible) in terms of their geographic scale, the timescale over which they could occur, whether the effects would be temporary of permanent, positive or negative, likely or unlikely, frequent or rare. Where numerical information has not been available, the assessment has been based on professional judgement and with reference to relevant legislation, regulations and policy.

Topic-specific definitions have been developed for what constitutes a significant effect, a minor effect or a neutral effect for each of the 14 environmental issues; these can be found in the relevant topic chapters in **Appendix A**. **Table 3.3** shows an example of these definitions along with the symbols used to record the effects within the assessment.

Table 3.3 Assessment scale for Biodiversity and Nature Conservation

Effect	Description	Detailed Guidance
++	**Significant** positive effect	Option would have a significant and sustained positive impact on European or national designated sites and/or protected species. (e.g. – fully supports all conservation objectives on site, long term increase in population of designated species) Option would have a strong positive effect on local biodiversity (e.g. – through removal of all existing disturbance/pollutant emissions, or creation of new habitats leading to long term improvement to ecosystem structure and function). Option will create new areas of wildlife interest with improved public access in areas where there is a high demand for access to these sites.
+	**Minor** positive effect	Option would have a minor positive effect on European or national designated sites and/or protected species (e.g. – supports one of the conservation objectives on site, short term increase in population of designated species). Option may have a positive net effect on local biodiversity (e.g. – through reduction in disturbance/pollutant emissions, or some habitat creation leading to temporary improvement to ecosystem structure and function). Option will enhance existing public access to areas of wildlife interest in areas where there is some demand for these sites.
0	**No** (neutral) effects	Option would not have any effects on European or national designated sites and/or any species (including both designated and non-designated species). Option would not affect public right of way or access to areas of wildlife interest.

[26] ODPM (2005) *A Practical Guide to the Strategic Environmental Assessment Directive*. Available online at: http://www.communities.gov.uk/publications/planningandbuilding/practicalguidesea

Effect	Description	Detailed Guidance
-	**Minor** negative effect	Option would have minor residual impact on European or national designated sites and/or protected sites (e.g. – prevents reaching one of the conservation objectives on site, short term decrease in population of designated species). These impacts could not be avoided but could be effectively compensated for. Option would have minor short-term negative effects on non-designated conservation sites and species (e.g. – through a minor increase in disturbance/pollutant emissions, or some loss of habitat leading to temporary loss of ecosystem structure and function). Option will decrease public access to areas of wildlife interest in areas where there is some demand for these sites.
--	**Significant** negative effect	Option would have a major negative and sustained effect on European or national designated sites and/or protected species (e.g. – prevents reaching all conservation objectives on site, long term decrease in populations of designated species). These impacts could not reasonably be compensated for. Option would have strong negative effects on local biodiversity (e.g. – through an minor increase in disturbance/pollutant emissions, or considerable loss of habitat leading to long term loss of ecosystem structure and function).
?	Uncertain	From the level of information available the impact that the option would have on this objective is uncertain.
n/a	No relationship	There is no relationship between the assessment objective and the proposals and it is not applicable to record any outcome of an assessment.

Appendix A contains the detailed assessments of each SDP option, on each environmental topic. The commentary includes the following considerations:

- identification and description of the potential effects;
- when the effect(s) could occur, and how long they could last (e.g. to short, medium or long term);
- the assumptions and uncertainties that underpin the assessment (and any information needed to address uncertainties);
- potential avoidance or mitigation measures for any significant negative effects; and
- possible enhancement measures where positive effects are identified.

SEA also requires that secondary, cumulative and synergistic effects of the options are assessed. These terms are explained in **Table 3.4**.

Table 3.4 Definitions of Secondary, Cumulative and Synergistic Effects

Type of Effect	Definition*
Secondary (or indirect)	Effects that do not occur as a direct result of the SDP, but occur at distance from the direct impacts or as a result of a complex pathway. Examples of a secondary effect of the SDP would include the materials (and embedded carbon) used in the development of the dismantling and interim storage facilities, or health effects of changes to air quality.
Cumulative	Effects that occur where several individual activities which each may have an insignificant effect, combine to have a significant effect. Examples of a cumulative effect of the SDP could include the potential effects on a European designated site, where a habitat or species is vulnerable and the cumulative effects of disturbance and pollutant emissions arising from development and operation causes a significant impact. Cumulative effects will also include the potential effects (if any) of a proposed activity and any other proposed and consented developments.
Synergistic	Effects that interact to produce a total effect that is greater than the sum of the individual effects. For example, this can occur where the toxicity of two chemicals is greatly increased when they are combined.

*Adapted from SEA guidance, ODPM (2005)

For the assessment of secondary, cumulative and synergistic effects to be effective, they should be considered as part of each assessment, rather than to being seen as a separate assessment. For the purposes of brevity, these effects which tend to be grouped together are captured subsequently under the heading of cumulative effects.

Of most relevance to the SDP is the potential for cumulative effects to take place in conjunction with other infrastructure projects or developments in proximity to the SDP site(s) e.g. the increase in local traffic, nuisance and air quality problems where two or more major projects are constructed at the same time. As a consequence, the potential for the SDP proposals to act cumulatively with other plans or proposed projects has been considered for both Devonport and Rosyth.

3.5.2 Assumptions used in the Assessment

The assumptions that have been used in the generic assessment are presented in **Table 5.2**. The assumptions used to assess the site-specific (integrated) options are presented in **Table 6.3**.

3.6 Technical Difficulties

3.6.1 Consistency

The SEA has been an iterative process, taking place alongside the development of the SDP proposals. This has helped ensure that environmental issues have been integrated into the consideration of the options and the supporting documents as they have developed.

However, much of the data has evolved and matured over that time, such that some of the figures quoted in the Public Consultation documents are now slightly different to those upon which the SEA is based. In most cases, the SEA figures are given as ranges, based on best estimates available at the time (for example the ILW estimate of 19-58 tonnes per submarine). The figures quoted in the consultation documents are largely within those ranges and hence still consistent (e.g. 50 tonnes of ILW, based on a detailed assessment of a 'T' Class submarine). Where inconsistencies have been identified in new data vs. SEA assumptions, the assessments have been reviewed and updated accordingly.

An additional issue is that this parallel development across multiple versions of draft documents may have resulted in minor inconsistencies between information in the Non-Technical Summary, the Environmental Report and in particular the detailed topic-based assessments in Appendix A. All have been checked for consistency prior to release; however some small errors may remain.

3.6.2 Assumptions

As the generic assessment in Chapter 5 is not site specific, it has not been possible to determine the exact magnitude of effects on, for example, designated sites. To support the assessment, broad assumptions have therefore been made with respect to the setting and characteristics of generic sites pre-development. However, it is acknowledged that site specific characteristics will influence the effects of the proposals on the assessment objectives. For example, it has been assumed that, on average, biodiversity is higher on an undeveloped site than either a previously-developed site or an 'existing' Licensed or Authorised site; however, in some instances this may not be the case (for example, certain 'brownfield' sites are included in the list of UKBAP Priority Habitats and Species). The key assumptions made in the absence of detailed information are listed in **Table 5.2**.

3.6.3 Data Gaps

As the SDP proposals are not yet finalised, there are a number of gaps in the available information (for example, the detailed design of the SDP facilities, or the likely capital investment required), although assumptions have been made to help address these gaps where possible. As further information/ data becomes available, it may be necessary to determine whether this may significantly alter the assessment of effects.

3.6.4 Future Effects

Submarine dismantling is projected to be undertaken over at least 27 years (based on the assumption that one submarine will be processed per year), with ILW being potentially stored until some point after 2040. As a result, there are inherent uncertainties about the long term environmental effects of operations and decommissioning, given the potential for changes to existing baseline trends (e.g. from climate change) which may affect, or alter the magnitude of effects arising from, the SDP proposals.

3.6.5 Level of Assessment

It has been difficult to balance the need for sufficient information to complete the assessment, whilst retaining its strategic focus. This is particularly pertinent in view of the complexity of the SDP proposals, and the instinctive desire to assess for the individual sites at the level of a site-specific Environmental Impact Assessment (which is not appropriate at this stage). More detailed, site specific assessments will be undertaken as part of the detailed planning process once the strategic decisions have been made.

3.6.6 Cumulative Effects

The SEA Regulations require that the cumulative effects of the SDP are assessed. These are an assessment of both the combined effects of activities arising from the development and the combined effects of the SDP proposals with effects from other proposed plans or projects. The plans considered are those adopted by an organisation, and the projects considered are those where a proposal is of sufficient scale to be subject to the Town and Country Planning (Environmental Impact Assessment) Regulations. In consequence it has not been possible within this assessment to identify all the possible future proposals which may have cumulative environmental effects with the SDP.

4. Assessment of Compatibility

4.1 Overview

The first requirement of the SEA is to check whether the aims and objectives of the SDP conflict in any way with the environmental objectives listed in **Table 3.2.** This allows the objectives of the plan or programmes to be refined at the outset, if a conflict is found.

4.2 Compatibility Assessment

The SDP User Requirement Document (URD)[27] defines the key drivers for the project, provides a Statement of Need and outlines the expected outcomes and consequential benefits of the SDP. The URD underpins the Business Case for the project and supports the MOD's decision making for the project.

The Statement of Need provides a clear statement of the purpose of the project:

> *"To dismantle, cost effectively, 27 defuelled nuclear submarines by 2050, without exceeding the submarine storage capacity, in a safe, secure, and sustainable manner which upholds MOD's reputation as a responsible nuclear operator; stores Intermediate Level Waste (ILW) until a national disposal route is available; disposes of all other radioactive, hazardous and non-hazardous waste in accordance with legislation and minimises impact upon military capability*."

The URD has 16 User Requirements, some essential, all important, that need to be addressed through the project's lifecycle to ensure that the projects outcomes and purpose are achieved effectively. These User Requirements cover economic impact; management of MOD liabilities; management of impact on operations; management of environmental impact and safety and programme delivery. Four of the 16 requirements are identified as *Key User Requirements* (KURs) and reflect the primary objectives of the project. These are outlined in **Table 4.1**.

Table 4.1 Key User Requirements of the SDP

Objective Number	Primary Objectives of the Project
1	Is as cost-effective as possible, minimising the costs of submarine dismantling and ILW storage without compromising safety, security, sustainability or regulatory compliance.
2	Provides a means to store Intermediate Level Waste (ILW) from 27 defuelled nuclear submarines until a national disposal route is established.

[27] DE&S Submarines (2011), Submarine Dismantling Project (SDP) User Requirement Document, Issue 4.0, February 2011 (Protect – Policy)

Objective Number	Primary Objectives of the Project
3	Is in service before the submarine storage capacity is reached, around 2020.
4	Inspires public confidence and thereby upholds the MOD's reputation as a responsible nuclear operator (to fulfil Ministerial commitments in response to previous public consultations, and commitments to undertaking further public consultation before major decisions are made[28]).

Each of these 4 KURs has been compared with the 14 SEA objectives to check whether the fundamental aims of the SDP and SEA are in conflict.

No significant conflicts were found. However, a range of small-scale possible environmental effects were found. These highlight the trade-off between achieving the benefits of the project and the potential effects of development and operation. **Table 4.2** shows the results, with further commentary below.

Table 4.2 Overview of the Assessment of Compatibility between the SDP Objectives and the SEA Objectives

Assessment Category and Overall Objective	SDP Key			
	Cost-effectiveness	ILW Storage	In-Service Date	Public Confidence
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems.	0	0/-	0	0
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts.	+	+	0	+
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.	0	+/-	0	+
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration.	0	0/-	0	0
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources.	0	0	0	0

[28] Secretary of State announcement, May 2000, and Min(DP) response to the recommendations of Consultation on ISOLUS Outline Proposals (CIOP), Feb 05.

Assessment Category and Overall Objective	SDP Key			
	Cost-effectiveness	ILW Storage	In-Service Date	Public Confidence
F. Water Maximise water efficiency, protect and enhance water quality.	**0**	**0/-**	**0**	**0**
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality	**0**	**0/-**	**0**	**0**
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.	**0**	**-**	**0**	**0**
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities.	**0**	**0**	**0**	**0**
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.	**0**	**0/-**	**0**	**0**
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities.	**0**	**++/-**	**0**	**0**
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	**0**	**-**	**0**	**0**
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features.	**0**	**0/-**	**0**	**0**
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity.	**0**	**0/-**	**0**	**0**

Score Key:	**+ +** **Significant** Positive effect	**+** **Minor** positive effect	**0** No overall effect	**-** **Minor** negative effect	**- -** **Significant** negative effect	**?** Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

SDP Objective 1 – Cost Effectiveness

With the exception of population, this project objective has no significant relationship or effect on the SEA objectives. As the project objective emphasises the need to ensure safety, security, sustainability and regulatory compliance, it is assumed that potential negative effects associated with the project to any SEA objectives will be minimised and therefore are unlikely to be significant. For the population objective, the effects are considered to be positive as maximising cost-effectiveness will reduce overall costs and could make funds available to be spent elsewhere maximising positive social and community outcomes (and would be consistent with the current Government spending constraints).

Over the long term, the project is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net benefit in relation to national public expenditure. However, a focus on cost effectiveness may limit the potential for any enhancement measures (such as any habitat enhancement or creation).

SDP Objective 2 – ILW Storage

This SDP objective is the only Key User Requirement that specifically involves the development of infrastructure. As a result, this project objective could have a number of small-scale positive and negative effects on the SEA objectives. For example, the effect on the population objective is likely to be positive as the SDP will maintain dockyard jobs and provide local investment during construction, operation and decommissioning. The potential effects on waste objective can be seen as significantly positive, as the SDP will deal with the legacy of the laid-up submarines, and the vast majority of the materials arising (including steel, lead, aluminium, brass and copper) can be recycled, with the profits being returned to the taxpayer. However, the project could also be seen as negative for waste, as it will generate considerable quantities of hazardous and non-hazardous wastes, where previously there has been none (laid-up submarines are not classified as waste). The potential effect on the health objective is considered to be positive overall as the project is addressing a potentially hazardous legacy waste stream for the benefit of the country, although there could be localised effects on workers and communities from disturbance during construction of the initial dismantling and interim ILW storage facilities.

The effect on other objectives such as biodiversity, water, air, cultural heritage and landscape will be mixed. As with any medium scale infrastructure project there will be a range of negative effects on these environmental objectives during the construction and operation of the facility. During decommissioning, these adverse effects can be addressed and the original state can be restored (for example, reintroducing removed soil) or possibly improved (for example, habitat enhancement).

There are certain objectives, such as climate change and energy use and land use and material use, where the potential effects are considered likely to be negative as the project will use resources (land, construction materials, energy, water) during construction or operation of the project and which cannot easily be reversed.

SDP Objective 3 – In-Service Date

The in-service date for the project has yet to be publicly confirmed; however, it does need to be before 2020, when afloat storage capacity at Devonport is expected to be reached. There are no environmental effects associated with this date per se; however, not achieving this date could eventually (in the longer term) lead to a range of potential environmental effects, associated with the need to provide additional capacity at Devonport for afloat storage of laid-up submarines. This *could* include constructing further docking facilities, which could in turn affect on the marine environment. It could also include the effects on (for example) air quality and disturbance from an increasingly frequent inspection and maintenance regime for the aging fleet.

The environmental effects of not dismantling the submarines (the ‘do minimum option) are addressed in **Section 6.2**.

SDP Objective 4 – Public Confidence

Securing and sustaining the public’s confidence in the MOD’s operations and its reputation as a responsible nuclear operator is likely to have a positive effect on the population and health objectives. Providing a transparent, open and inclusive approach to consultation will help to ensure community concerns are captured and considered, and should help people understand the project proposals better. Successfully building trust in the MOD (and its commercial partners) to deliver a safe, secure, and sustainable solution to submarine dismantling will reduce negative perceptions and any local anxiety over the project.

4.2.1 Overall Project Purpose

Although some small-scale effects are anticipated for KUR objective 2 (ILW storage), the project is working towards an overall societal good by dismantling end-of-life nuclear-powered submarines and storing the ILW in a responsible and sustainable manner, whilst not leaving a legacy for future generations. This is demonstrated by the fact that there are no conflicts (i.e. no significant negative effects found) between the SDP objectives and the SEA objectives.

5. Assessment of the Generic Stages of the SDP

5.1 Overview

This section presents a summary of the assessments that have been carried out on the generic stages of the SDP. Within each generic stage there are a number of viable options (reiterated in **Table 5.1** below) which have been assessed for their potential environmental impact. These stages are explained in **Section 2.3.** Each assessment is presented in detail in **Appendix A**.

Table 5.1 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; or – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land; or – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; or – 'existing' Licensed/ Authorised site(s).

5.2 Assumptions for the Generic Assessment

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described below. All of the detailed assumptions are included in Appendix A.

Table 5.2 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than 'greenfield' sites, although it is recognised that 'brownfield' land can be important for conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear

Category	Assumption Description
	Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the ‘Dock Bottom Village’), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m$^{2.}$ Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2. As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, ‘greenfield’ site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an ‘existing’ site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct (‘wet’) tow, or a ‘dry’ tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average). • It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine • It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine.

Category	Assumption Description
III)	• Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one submarine is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** - Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since breaking a cleared submarine is little different to breaking a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be transported from the initial dismantling facility to the interim storage facility by sea, rail or road. • **Fully-packaged ILW -** It is assumed that each 3m^3 container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site

Category	Assumption Description
	and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

5.2.1 Proposed Mitigation Measures

The generic assessment of the SDP stages has identified a number of mitigation measures which could be implemented to avoid or minimise any potential negative effects, and to enhance the positive effects. These measures are included within each of the topic-based assessments in **Appendix A.** Those which cut-across a number of the SEA objectives are summarised in the conclusions at **Chapter 7.**

5.3 The Environmental Effects of Stage I - Designing and Developing Initial Submarine Dismantling Facilities

This stage involves designing and building the specialist facilities needed to receive the submarines safely, and to remove the radioactive materials from them. The results of the SEA assessments for the three generic types of development site are shown in **Table 5.3** below, with commentary provided in the following sections. A full assessment is provided in Appendix A.

Table 5.3 Generic Assessment Summary for Stage I: Designing and Developing Initial Submarine Dismantling Facilities

Option	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
'Greenfield' site	--	++/-	-	-	--	--	-	--	--	--	-/--	--	-/--	--
'Brownfield' site	-	++/--	-	-	0	-	-	-	0	-	-/--	+/-	-/?	-
'Existing' Licensed/ Authorised site	-	+/-	0	-	0	-	-	-	0	-	-	+	-/?	0

Score Key:	+ + Significant Positive effect		+ **Minor** positive effect		0 No overall effect		- **Minor** negative effect		- - **Significant** negative effect	? Score uncertain
NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.										

5.3.1 Likely Significant Effects of Developing Initial Dismantling Facilities on an Undeveloped, 'Greenfield' Site

Biodiversity and Nature Conservation

Constructing initial dismantling facilities on a coastal 'greenfield' site will require ancillary facilities and infrastructure (including, for example, roads, docking facilities and stores) to be developed. This is likely to have a significant negative effect on biodiversity, reflecting the direct and indirect effects of land take on habitats and species (especially if the site includes habitats important for breeding or migration). It also reflects the potential effects of construction activities and transport (noise, dust etc) on biodiversity. Aquatic and intertidal environments may also be adversely affected by construction activities on the waterside and by any dredging necessary to establish deep-water channels to accommodate submarine movements to and from the site.

Population

This option is expected to have a mixed effect on the population. The significant positive score is due to the potentially significant number of jobs (in excess of 100 FTEs per annum) and the associated economic benefits of increased local investment that may be generated during construction. However, the extent to which these benefits are felt locally will depend on the type of posts created, the characteristics of the local labour market and the recruitment/procurement policies of the contractors employed to undertake the work, as well as any requirements imposed by the MOD. There may be potential to ensure that the contractor offers training opportunities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from the National Apprenticeship Service (NAS).

Whilst construction of a new facility will incur significant 'up front' costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage, so that there will be a net benefit in relation to national public expenditure.

Conversely, the small negative score for Population reflects the potential for construction-related effects, such as noise, vibration, traffic, dust etc. Whilst these effects would be more noticeable in an undeveloped location than in a developed one, the community is likely to be rural and dispersed, which would reduce the scale of potential disturbance.

Geology and Soils

Development of a 'greenfield' site will require the removal of a significant volume of soil which, depending on the soil type, may have a significant negative effect on the geology and soils objective. The significance of this effect will be exacerbated if the site includes designated geological conservation sites or important geological features.

Invasive construction techniques, such as piling and dredging, may also cause a small risk of land contamination from dust deposition, effluent discharge or through accidental spillage. It would be expected that any potential contamination would be sufficiently mitigated by following best practice guidance and through the adoption of a Construction Environmental Management Plan (CEMP). However, a small risk of accidental or unforeseen discharges would remain.

Water

The impact of waterside construction activities, together with the relatively high volume of water which is likely to be required during construction (e.g. for cement mixing and dust suppression) and water discharge (including surface run-off), has been assessed as having a potentially significant negative effect on water resources and water quality.

Waste

Developing a new site has the potential to create significant volumes of excavated soil and subsoil, as well as significant quantities of construction-related waste. However, it is standard practice to minimise the volume of waste by reusing soil and rock as a resource on site and by minimising construction waste at source. As a result, the score is highly conditional, and could feasibly be a minor negative.

Climate Change and Energy Use

Since CO_2 emissions generally increase in line with the scale of development, this option (which would require development of all supporting infrastructure and ancillary facilities) is assessed as having a potentially significant negative effect on the energy objective. In particular, the high volume of concrete needed during construction is likely to be a significant factor, since a considerable amount of energy is needed to manufacture the cement.

Coastal Change and Flood Risk

Since the new site would have to be on the coast, there is a risk that construction could be affected by storm surges; rising sea levels may increase this risk in the longer term. This, however, depends on the exact location chosen. Constructing significant new waterside facilities and dredging may alter the shape of the coastline, which could have knock-on effects on erosion or sediment deposition rates elsewhere. This would be a particular issue if it increases the flood risk for local communities or affects important bird feeding areas. Flood risk both on and off-site may also increase as the site is cleared and levelled, and soil is replaced by impervious hard-standing/ buildings.

Transport

This option has been assessed as having a potentially significant negative effect on the transport objective. Construction of initial dismantling facilities on an undeveloped coastal site is likely to significantly increase transport movements, congestion and associated accident risks on the local road network associated with construction staff, construction vehicles, concrete tankers and deliveries throughout the construction phase. Construction of this scale may require new roads or rail spurs to be built, or enhancements to be made to the existing transport network. This may mitigate the impacts of traffic congestion, but not remove the additional noise, vibration or air emissions.

Land Use and Materials

Due to the considerable area of land required under this option, it is considered that development would significantly alter patterns of land use and would lead to the loss of agricultural or otherwise 'natural' land. There is also potential for development of the site to lead to the incremental development, over time, of land adjacent to the facility, as well as new transport infrastructure which could make the location attractive for other business or activities. Any such change would, however, need to be consistent with local planning policy. Conversely, there is potential for the radioactive element of the site's operation to be viewed as undermining the attractiveness of the area which may lead to disinvestment in any existing developed land nearby. However, this is highly dependent on how the facilities are perceived.

Development of the scale proposed under this option would require a significant volume of natural resources such as sand, rock, gravel, metals and wood. Sourcing these will have a degree of environmental impact where they are produced. However, there would be an opportunity to ensure that all new buildings and structures incorporate sustainable design and construction practices which may help mitigate (to an extent) the negative effects identified.

Cultural Heritage

The considerable land take and supporting infrastructure needed for a new development could lead to the loss of, or damage to, both visible cultural heritage and archaeological features, and potentially buried archaeological remains at the site or on the adjacent seabed. Construction activities may also have a significant negative effect on the setting and amenity of local features (such as World Heritage Sites, Conservation Areas, Listed Buildings, Scheduled Monuments and Registered Parks and Gardens).

There is also the potential for an increase in traffic over the construction period to have a negative effect on historic features as a result of pollution from engine exhausts and/or vibration.

Landscape and Townscape

Development of a new facility on a 'greenfield' site may have a significant negative effect on the character of the landscape (both in the short term during construction and in the longer term once development is complete). This reflects the scale and built form of the facility, which is likely to be incompatible with the rural character of the surrounding area.

There may be a need to construct new roads, or improve the existing road/rail network. These works may have a negative effect on local landscape character by fragmenting or removing key landscape elements. Increases in construction traffic on local road networks may also affect the tranquillity of these areas.

Coastal development and dredging could change the nature of the coastline outside the site, affecting the wider landscape/seascape. Depending on location, there is potential for development to affect public access to open spaces.

5.3.2 Other Potential Effects

Overall, there are likely to be negative (but not significant) effects on the SEA objectives for **health**, **noise and vibration** and **air quality.** This is primarily due to the impact of construction works and traffic, although the significance of these effects largely depends on the proximity of sensitive receptors and existing baseline conditions.

5.3.3 Likely Significant Effects of Developing Initial Dismantling Facilities on a Previously Developed, 'Brownfield' Site

Population

Similar to an undeveloped site, construction of initial dismantling facilities on a previously developed site is expected to have mixed effect on the population objective. The significant positive score reflects the scale of development and the potential for the creation of both jobs and local investment, and the long term financial savings associated with removing the legacy.

Unlike the 'greenfield' option, the negative effect is also likely to be significant, because construction-related disturbance is likely to be more acute if the brownfield land is already in a built-up area, with people living close by.

Waste

The amount of waste associated with site clearance would be expected to be less than for an undeveloped site; however, significant development would still be needed. As a result, the amount of waste might be significant, although it is not expected to be as significant as for an undeveloped site. Again, the volume of waste will be minimised as standard industry practice and, as a result, the score could feasibly be more minor than significant.

5.3.4 Other Potential Effects

In contrast to development on an undeveloped site, less significant negative effects have largely been identified in relation to **biodiversity and nature conservation, noise and vibration, water, air, climate change and energy use, transport, cultural heritage and landscape and townscape**. This reflects the expectation that a majority of infrastructure needed, including hard-standing, docks, roads/ rail spurs etc. would already be in place. This would reduce the scale of development (i.e. land take/construction materials required), duration of construction activity and volume of associated traffic movements.

With specific regard to **biodiversity and nature conservation**, it is also envisaged that the intrinsic biodiversity value of a previously developed site is likely to be less than that of undeveloped land. As some docking facilities would already be in place and the extent of dredging required reduced, it is also envisaged that the possible impact on aquatic/ intertidal environments would be less severe. However, it should be noted that previously developed sites are often contaminated with pollutants from past industrial activities. Developing such sites could mobilise these pollutants, which have the potential to affect biodiversity (as well as objectives related to health and water) if not properly managed.

Development of a 'brownfield' site is likely to have a short term and temporary negative effect on **landscape and townscape** as a result of construction activities. However, it is assumed that there would be a greater prospect for development to be in-keeping with the character of the surrounding area compared to development on 'greenfield' land and overall, this option has been assessed as having a negative effect on this objective.

This option has been assessed as having a mixed (positive and negative) effect on **land use and materials**. This principally reflects the fact that the use of a previously developed site is consistent with current national planning policy, but that there is potential for development of the facility to be viewed as undermining the attractiveness of the area (which could lead to an increase in vacant land), although this is highly dependent on how the facilities are perceived and can be largely avoided through careful design.

5.3.5 Likely Significant Effects of Developing Initial Dismantling Facilities on an 'Existing,' Licensed or Authorised Nuclear Site

As **Table 5.3** shows, no significant environmental effects were identified for developing existing Licensed/ Authorised sites.

5.3.6 Other Potential Effects

Population

Since 'existing' sites already have the majority of the infrastructure and amenities needed to undertake initial dismantling, the scale and duration of construction activities would be generally less severe than the other options; this is reflected in the minor negative score. The minor positive score reflects the reduced potential for employment and significant local investment, although there is a greater potential for using local skilled labour and suppliers.

Other Categories

Similar to developing a 'brownfield' site, the potential for negative effects has been identified for **biodiversity and nature conservation, noise and vibration, water, air, climate change and energy use, transport, waste** and **cultural heritage,** although these effects are only expected to be minor, and not significant. Construction is also considered to have a positive effect on **land use and materials**, since using a Licensed/ Authorised site will allow best use to be made of existing infrastructure and resources (although this precludes the potential to restore previously redundant land to economic use). There is little potential for the SDP to affect the economic potential of adjacent land since (unlike the other options) activities involving radioactive or nuclear materials will already be taking place.

5.3.7 Influence of the Technical Options for Removing the Radioactive Materials on the Severity of Effects

All three technical options (separation of the RC, removal and storage of the RPV, removal and size reduction of the RPV to packaged waste) will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of the initial dismantling facilities will be similar (between 15,000 and 20,000 square metres) across all options. However, where and when some site components are installed will differ across the technical options reflecting the scope of initial dismantling operations.

For the RC and RPV options, the specialist facilities needed to package the ILW will not be needed until after interim storage. As a result, the environmental effects of construction (noise and vibration, air quality, traffic, disturbance etc) will be lower in the short-term, relative to the packaged waste option. Phasing construction may also serve to keep levels of disturbance and emissions to air below levels where they may have a negative effect on, for example, biodiversity and health. Conversely, these options could result in further environmental effects in the longer term as those specialist facilities to package the ILW are developed. They may also undermine the potential for wider economic benefits to be realised, as development would not benefit from the economies of scale associated with constructing the complete facility in a single phase.

5.4 The Environmental Effects of Stage II - Designing and Developing Interim ILW Storage Facilities

This stage involves designing and building the specialist facilities needed to store the Reactor Compartments, the Reactor Pressure Vessels or the Packaged Waste, until such time as the proposed GDF is able to accept the radioactive materials from the submarine programme. A summary of the assessments of the three generic land use options for Stage II of the SDP is shown in **Table 5.4**. A full assessment is provided in Appendix A.

Table 5.4 Generic Assessment Summary for Stage II: Designing and Developing Interim ILW Storage Facilities

Option	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
'Greenfield' site	-/--	++/-	0/-	-	-/--	-/--	-	--	--	--	-	-/--	-	-/--
'Brownfield' site	-	++/--	0	-	0	-	-	-	0	-	-	-/+	-	0/-
'Existing' Licensed/ Authorised site	-	+/-	0	-	0	0/-	-	-	0	-	-	+	-	0/-

Score Key:	+ + Significant Positive effect	+ Minor positive effect	0 No overall effect	- Minor negative effect	- - Significant negative effect	? Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

The range of environmental effects that would be expected from developing interim ILW storage facilities were found to be similar to those for developing the initial submarine dismantling facilities (Stage 1), since both would essentially be construction projects. However, the *magnitude* of those effects was found, in general, to be slightly lower for ILW storage than for initial dismantling, largely reflecting the reduced complexity of ILW storage facilities, and the reduced footprint: Initial dismantling requires around 17,500 m^2 of land, whilst ILW storage requires between 801 and 11,600 m^2.

5.4.1 Likely Significant Effects of Developing Interim ILW Storage Facilities on an Undeveloped, 'Greenfield' Site

As per Stage 1, constructing interim ILW storage facilities on undeveloped, 'greenfield' land could bring potentially significant negative effects on **climate change and energy use**, **coastal change and flood risk** and **transport.** Negative effects on **biodiversity and nature conservation, geology and soils, water, land use and materials** and **landscape and townscape** also have the *potential* to be significant. The effect on the population objective could again be significantly positive; due to the investment and jobs associated with construction (this score is also slightly negative as a result of potential disturbance to the community). The magnitude of all these effects primarily reflects the scale of development associated with the construction of facilities on a 'greenfield' site which will require ancillary facilities and infrastructure (including, for example roads, docking facilities and stores) to be developed.

5.4.2 Other Potential Effects

Overall, there are likely to be minor negative effects on the SEA objectives for **noise and vibration**, **air quality** and **cultural heritage.** This is primarily due to the impact of construction works and traffic, although the significance of these effects largely depends on the proximity of sensitive receptors and existing baseline conditions. Due to the volume of excavated material and construction waste expected, but taking into account the likelihood that this material will be recycled or re-used (for example, as landscaping or as aggregates for construction projects), overall the option is considered likely to have a minor negative effect on the **waste** objective.

5.4.3 Likely Significant Effects of Developing Interim ILW Storage Facilities on a Previously Developed, 'Brownfield' Site

Population

As per Stage 1, construction of an ILW storage facility on a previously developed, 'brownfield' site is expected to have mixed effect on the population objective. The significant positive score reflects the scale of development, whilst the significant negative score reflects the potential for significant construction-related disturbance to the local community, assuming the area is already built up and populated.

5.4.4 Other Potential Effects

The range and scale of the less significant environmental effects are very similar to those identified for developing the initial dismantling facilities, described in **Section 5.2.4**. Negative effects were identified in relation to **biodiversity and nature conservation, noise and vibration, water, air, climate change and energy use, transport, waste and cultural heritage.** This reflects the expectation that a majority of infrastructure needed, including hard-standing, docks, roads/ rail spurs etc. would already be in place. This would reduce the scale of development (i.e. land take/construction materials required), duration of construction activity and volume of associated traffic movements.

This option has also been assessed as having a mixed (positive and negative) effect on **land use and**

materials, reflecting the benefits of using previously-developed land but acknowledging the *potential* for the storage facility development to be viewed negatively and so affect adjacent uses.

5.4.5 Likely Significant Effects of Developing Interim ILW Storage Facilities on an ‘existing,’ Licensed or Authorised Nuclear Site

As **Table 5.4** shows, no significant environmental effects were identified for developing existing Licensed/ Authorised sites.

5.4.6 Other Potential Effects

The effects are very similar to those identified in **Section 5.2.6** for the initial dismantling facilities, with potential minor negative effects on **biodiversity and nature conservation, noise and vibration, air, climate change and energy use, transport, waste** and **cultural heritage** due to construction disturbance. The **population** objective is again mixed**,** reflecting the potential for both employment/local investment and construction-related disturbance to the local community.

5.4.7 Influence of the Technical Options for Removing the Radioactive Materials on the Severity of Effects

The scale of environmental effects for ILW storage is strongly dependant on the technical option implemented, since each process produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m^2 of space would be needed to house the 27 sealed reactor compartments plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/ maintenance facilities and office/ admin areas);

- RPV storage: 801m^2 of space would be needed to house the 27 boxed reactor pressure vessels plus supporting infrastructure, as above; and

- packaged ILW storage: 1,005m^2 of space would be needed to house the estimated 162x 3m^3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

The footprint of the RC storage facility is over eleven times the size of the estimated packaged waste facility footprint, and over fourteen times larger than that of the RPV storage facility. Consequently, it is expected that land take, the construction materials required, duration of construction activity and volume of associated traffic movements would be greatest for the construction of a RC interim storage facility. This is expected to increase the magnitude of effects (both positive and negative) associated with the development of the facility across all generic land use options.

5.4.8 Mitigation Measures

The following measures are proposed to avoid or mitigate the potential environmental effects associated with developing the initial dismantling and storage facilities.

Proposed mitigation measures for developing the initial dismantling and interim storage facilities
• Avoid development and/or additional dredging in designated nature conservation sites, especially if this could damage the features for which the site is protected. • Implement a Construction Environmental Management Plan (CEMP) and a Waste Management Plan during construction to minimise disturbance (especially from noise, vibration and light), emissions into the environment and wastes. A waste minimisation strategy should also be used, to identify where waste arises in design, procurement and logistics, and to set out clear mechanisms for reducing waste. • Implement an Environmental Management System (EMS) for the whole life of the project, to minimise effects on the environment or local communities. • Minimise the size of new development to limit land-take, use of natural resources and reduce the risk of pollution and flood risk. • Complete Flood Risk Assessments, including a surface drainage strategy and allowance for climate change. • Minimise and manage traffic movements to reduce air pollution and congestion (particularly in built up areas or those with existing air quality problems), and consider the use of shipping or rail to move construction materials. • Inform the public of developments on an ongoing basis, e.g. by attendance by community meetings and development of educational opportunities. • Use local workers and suppliers where possible, and consider training opportunities (e.g. apprenticeship schemes). • Ensure that UK Government standards for sustainable procurement and efficient building design are included and enforced in all construction and operational contracts. This could include using local materials and those with lower embodied energies; just in time delivery, considering minimisation of whole-life carbon footprint in the design and build of the facilities and integrating low and zero-carbon technologies. • Consider designing the facilities, especially any buildings, in a way which complements the local area and harmonises with any key views or designated landscape areas. • Determine the historic and archaeological value of the site(s) at the earliest stage and take appropriate steps to address any issues arising. This could include reusing any vacant historic buildings. • All of the above should be included in any tender specifications for construction contracts.

5.5 The Environmental Effects of Stage III - Docking the Submarines and Processing the Reactor Compartments

This stage involves moving the submarines from where they are currently stored, docking them safely into the initial dismantling facility/ies and removing all of the radioactive materials from them. A summary of the assessments of the three technical options for Stage III of the SDP process is shown in **Table 5.5**. A full assessment is provided in **Appendix A.**

Table 5.5 Generic Assessment Summary for Stage III: Docking the Submarines and Processing the Reactor Compartments

Option	A: Biodiversity and Nature Conservation	B Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
Separate RC	-	+/?	-/+	-	0	-	-	-	0	0	-	0	0/-	0
Remove RPV	-	+/?	-/+	-	0	-	-	-	0	0	-	0	0/-	0
Packaged Waste	-	+/?	-/+	-	0	-	-	-	0	0	-	0	0/-	0

Score Key:	+ + **Significant** Positive effect		+ **Minor** positive effect		0 No overall effect		- **Minor** negative effect		- - **Significant** negative effect	? Score uncertain
NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.										

5.5.1 Likely Significant Effects of the Technical Options for Removing the Radioactive Materials

No *significant* positive or negative effects were identified across any of the three technical options.

5.5.2 Other Potential Effects of Separating the Reactor Compartment

Biodiversity and Nature Conservation

Separation of the RC and associated transport movements may result in some limited disturbance to certain species and habitats located adjacent to the initial dismantling facility or transport networks. There is also potential for SDP activities to directly or indirectly affect the marine environment, as a result of the accidental release of pollutants and/or radioactive materials into the environment during initial dismantling. However, as SDP activities would be closely regulated, subject to stringent environmental permitting requirements with Best Available Techniques (BAT) principles adopted, the risk of unplanned discharge is considered to be very low.

Population

Operational activities could generate economic benefits through the creation of jobs and investment in local supply chains, although any such benefits would be limited in view of the small scale of the works.

Health and Wellbeing

The estimates of the individual radioactive dose that workers would receive during RC separation (and subsequent dismantling to packaged ILW) have been assessed as being between 0.07 milliSieverts (mSv) and 0.12 mSv per year (depending on the number of workers employed). These estimates are between 0.35% and 0.6% of the annual worker dose limit of 20mSv per year. This represents the lowest radiation dose of all three technical options, which primarily reflects the fact that storing the RCs will maximize the amount of natural radioactive decay that can take place before the RPV is removed from the RC, so minimizing worker doses when the RC is eventually dismantled. No effects on the public or other dockyard workers from planned activities would be expected, as the radiation would, by its very nature, be localised to within a few feet of the planned dismantling activities. Any planned discharges to air or water from the process are projected to remain well below statutory levels.

However, there is always the potential for pollutants and/or radioactive materials to be accidentally released into the initial dismantling site during an unplanned event, although as the radioactive materials themselves are largely steel components, they could not escape onto the wider environment (unlike, for example a gas or a liquid). The *risk* of such an unplanned release into the environment increases in proportion to the extent of dismantling, although strict legal controls are in place to prevent such events from occurring. Separating the RC is the least intrusive of the options and allows for further natural radioactive decay to take place prior to size reduction. As a result, the already very low risk of any accidental discharge or hazardous materials reaching the wider environment and hence the public would be the lowest of the three technical options.

Noise and Vibration; Air Quality

Transport-related emissions from moving the submarines to the initial dismantling site(s) would depend on how they are moved, and the distances involved. However, it is expected that only one submarine will be processed per year, so air emissions would be insignificant.

Once docked, the submarines would be cut apart in two places inside a dry dock to remove the intact RC. Once separated, the RC (and possibly the other sections) would be sealed shut with steel plates. Unless the dry dock is protected by a building, there is the potential for elevated noise and vibration levels and increased levels of dust and fumes, which could lead to an increase in disturbance to people and wildlife.

Waste

All three technical options will lead to the creation of similar amounts of radioactive and non-radioactive waste. Although delaying the point at which the RC is dismantled will reduce levels of radioactivity, this does not translate into a significant reduction in the volume of ILW or LLW produced.

ILW volumes are estimated to be between 19 and 58 tonnes per submarine, which equates to between 513 and 1566 tonnes of ILW in total, for 27 submarines.

LLW volumes are estimated to be between 91 and 154 tonnes per submarine, giving between 2,457 and 4,158 tonnes of LLW in total.

vLLW volumes are estimated to be 62 tonnes per submarine, giving 1,674 tonnes in total.

It is estimated that only a small proportion of the LLW would actually need to be disposed of; since the majority of the metal will only be surface contaminated; the uncontaminated metal could be separated at the LLW facility (where specialist tools are available) and recycled.

Climate Change and Energy Use; Coastal Change and Flood Risk

Separating the RCs will result in increased energy use associated with, for example, the use of cutting equipment and transportation which is expected to have a minor negative effect on this objective.

Since the site would have to be in a coastal location, there is always the potential for it to be affected by rising sea levels or flooding. However, this would be highly dependant on the location, and it is expected that the appropriate flood defences or resilience measures would be in place by law before any dismantling work could take place. As a result, the SDP is assessed as not having a measurable effect on flood risk or coastal change.

Cultural Heritage

There is potential for minor negative effects on cultural heritage features arising from any uncontrolled (e.g. accidental) vibrations during removal of the RC. The risks of this are however very small.

5.5.3 Other Potential Effects of Removing the Reactor Pressure Vessel

The type and range of potential effects associated with this option will be largely similar as for separating the Reactor Compartment.

Regarding **health and well-being,** individual worker dose exposure estimates from RPV removal (and subsequent size reduction to packaged ILW) are estimated to be between 0.47 mSv and 0.85 mSv per year, depending on the number of workers employed. These estimates are 2.35% and 4.25% of the annual worker dose limit, and are higher than for RC separation, reflecting the fact that removing the RPV from the RC prior to interim storage is a more dose intensive activity than removing it after interim storage.

Storing the RPVs intact will, however, allow natural radioactive decay to take place over time, so it will be easier to minimize worker doses when they are eventually cut apart than it would be if they were size reduced to packaged waste ‘up front.’

Once again, no adverse effects on the public or other dockyard workers from the planned activities would be expected.

The potential for accidental release of pollutants and radioactive materials into the environment during initial dismantling is in theory slightly higher, as this option involves cutting into the RC, handling the RPV and segregating the LLW. However, this risk will have to be kept as low as reasonably practicable by law, in order for work to proceed.

5.5.4 Other Potential Effects of Size Reducing the Reactor Pressure Vessel to form Packaged Waste

This option involves removing the RPV and associated components from the Reactor Compartment and size reducing it immediately, packaging the ILW into 3m^3 containers that would be compatible with the proposed GDF. Since all this work would be undertaken ‘up front’ with no work needed after interim storage, the magnitude of certain effects were considered to be slightly greater than those associated with either RC separation or RPV removal, although none were deemed to be significant.

Regarding **health and well-being,** the expected individual radiological doses to workers from planned activities are estimated to be between 0.5mSv and 0.9mSv per year (depending on the number of workers employed). These estimates are 2.5% and 4.5% of the annual worker dose limit. This dose is similar to the RPV removal and storage option, reflecting the fact that, whilst this option would not benefit from natural dose reduction, RPV removal is the most dose intensive activity that is carried out. This is because statutory requirements to minimise occupational dose will dictate that the size reduction to packaged waste is carried out using remote handling technologies in shielded facilities known as 'hot cells'.

Once again, no adverse effects on the public or other dockyard workers from the planned activities would be expected.

The potential for an accidental release of pollutants and radioactive materials into the environment is in theory the highest of the three options, as the RPV itself would be taken apart and packaged 'up front.' However, this risk would again have to remain very low in order for work to proceed.

5.5.5 Mitigation Measures

The following measures are proposed to avoid or mitigate the potential environmental effects associated with undertaking initial dismantling.

Proposed mitigation measures for removing the radioactive materials from the submarines
• Minimise the distance travelled by the intact submarines and resulting radioactive wastes. Consider using the most efficient/ least damaging modes of transport where possible • Manage HGV movements to minimise congestion and air quality problems (especially for areas with existing AQMAs), and consider routing and timing of transport to avoid protected areas and minimise impacts on sensitive receptors. • Adopt best practice procedures for the protection, storage and handling of materials. A robust logistics plan should be developed, identifying how materials are to be moved to, from and on site and how they are stored. • Seek to use local contractors and suppliers where possible. Any potential to offer training opportunities (e.g. apprenticeship schemes) should be pursued. • Continue using a Site Waste Management Plan and a waste minimisation strategy to identify where waste arises in design, procurement and logistics and to set out clear mechanisms for reducing waste. • Ensure an emergency preparedness plan is in place setting out responses to unplanned events. • Communicate with the public on an ongoing basis to help reduce anxiety relating to site operations.

5.6 The Environmental Effects of Stage IV - Dismantling and Recycling the Residual Submarine Hulls and Processing Wastes

Neither land use nor technical options are discriminated at this stage, which deals with managing the non-radioactive wastes associated with initial dismantling, and transporting the residual submarine hulls to an approved UK ship recycling facility for processing. Basic consideration has been also given to the environmental effects arising from processing the residual hull at the initial dismantling site, to cover all possible eventualities. It should be noted, however, that the project assumes that submarines will NOT be broken up and recycled at the initial dismantling site. A summary of the assessment for this stage is shown in **Table 5.6**. A full assessment is provided in Appendix A.

Table 5.6 Generic Assessment Summary for Stage IV: Dismantling the Residual Submarine Hulls and Processing Wastes

Option	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
Recycle at a UK ship recycling facility	0	+/?	0	0/-	0	0	0	-	0	0	++/ --	0	0/+/ ?	0
Recycle at initial dismantling site	-	+/?	0	-	0	-	-	-	-	-	++/ --	-	+/-	0/-

Score Key:	+ + Significant Positive effect		+ Minor positive effect		0 No overall effect		- Minor negative effect		- - Significant negative effect	? Score uncertain
NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.										

5.6.1 Likely Significant Effects of Dismantling and Recycling the Residual Submarine Hulls

Waste

A mixed significant positive and negative effect has been identified for both recycling options. The recycling process will create multiple waste streams where none existed before. However, the SDP will deal with the legacy of the laid up submarines once and for all. The vast majority of the material arising from the submarine hulls (more than 100,000 tonnes in total) will be high-grade steels and other valuable metals such as copper and other precious metals from wiring and in electronic components. All of these will be recyclable, and will help offset the cost of the recycling.

Before they are laid up for long-term storage, hazardous liquids, resins and gases are also removed from the defuelled submarines to reduce the risk of leakage. This includes oils, lubricants, cooling water and ion exchange resins. During their operational life, the older submarines will have had most hazardous materials such as asbestos removed for heath and safety reasons. The newer submarines do not generally contain asbestos; so as a result, few of the laid-up submarines now contain this type of material. Nevertheless, some residual amounts of hazardous materials (including the more inaccessible asbestos, some hazardous chemicals such has potassium chromate in the Primary Shield Tank, coatings and trace amounts of PCBs in electrical components) may remain; especially in the older submarines. These will require appropriate management, noting that some of these materials may already be at or lower than the level of free release.

5.6.2 Other Potential Effects of Dismantling and Recycling the Residual Submarine Hulls at a Commercial Facility

The movement and subsequent recycling of the submarine hulls using an existing UK commercial has been assessed as having a largely neutral effect against the assessment objectives. This reflects the assumption that no additional facilities would need to be built, and that recycling the submarines would merely be a continuation of the existing ship recycling activities taking place. Hence operational issues such as noise and emissions would already be well controlled and would not be expected to change significantly. The movement of submarines from the initial dismantling facility to a commercial site will be limited to one movement per year. As a result, any transport-related effects are likely to be insignificant.

There is a risk of accidental discharge of potential contaminants (e.g. fuel, oil and any remaining hazardous material) during movement; however, it is considered that any such risk is remote as the sections will have undergone preparation for safe transportation.

Recycling would bring some potential benefits to the **population** objective by supporting existing jobs and investment in local supply chains at the shipyard. Ship recycling is relatively energy intensive, hence a small adverse effect is recorded for **climate change and energy use**. Whilst the effects of extreme weather and a changing climate may also impact on flood risk for the shipyard in the longer term, this could be mitigated and is not seen as a significant issue for the project.

5.6.3 Other Potential Effects of Dismantling and Recycling the Residual Submarine Hulls at the Initial Dismantling Facility

The project assumption is that the residual hull will be moved offsite to a commercial UK facility for recycling, and there is <u>no intention</u> to recycle the submarines at the point of waste generation. If, for whatever reason, it did become necessary to dismantle submarines at the initial dismantling site rather than a commercial facility, it is assumed that a new ship recycling capability would have to be developed. Construction and the additional operational activities would be likely to generate a similar range of effects to those associated with construction of the initial dismantling facilities with the potential for negative effects on **every objective** except health and geology and soils.

On-site ship recycling has a *potential* positive effect on the **population** objective due to the employment opportunities and local economic benefits likely to be generated during both the construction and operation of the facility. However, the extent to which these benefits would be felt locally would depend on the type of posts created, the characteristics of the local labour market and the recruitment/procurement policies of the contractors employed to undertake the work, as well as the requirements imposed by the MOD.

5.6.4 Mitigation Measures

The following measures are proposed to avoid or mitigate the potential environmental effects associated with transporting and recycling the residual submarine hulls.

Proposed mitigation measures for transporting and recycling the residual submarine hulls
• Consider whether to conduct an environmental assessment for transporting the residual submarine hulls to the ship recycling facility. • Minimise the distance travelled by the submarine hulls where possible, and consider using the most efficient/ least damaging modes of transport. • Consider routing and timing of submarine transport to avoid protected areas and minimise impacts on sensitive receptors. • Manage HGV movements in and out of site to minimise congestion, disturbance and air quality problems (especially for areas with existing AQMAs.). • Ensure that transport mechanisms have emergency response plans to address any potential unplanned events. • Avoid the use of a heavy-lift ship (or any similar method) to transport residual sections, where this would require additional Capital dredging to be carried out. • Implement waste minimisation and waste management best practice, with a focus on materials resource efficiency (in accordance with WRAP and Defra guidance). This should include consideration of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, and the EU Strategy for Better Ship Dismantling. • Continue using a Site Waste Management Plan and a waste minimisation strategy to identify where waste arises in design, procurement and logistics and to set out clear mechanisms for reducing waste. • Communicate with the public on an ongoing basis to help reduce anxiety relating to site operations. • Seek to use local contractors and suppliers where possible. Any potential to offer training opportunities (e.g. apprenticeship schemes) should be pursued. • Adopt best practice procedures for the protection, storage and handling of materials. A robust logistics plan should be developed, identifying how materials are to be moved to, from and on site and how they are stored.

5.7 The Environmental Effects of Stage V - Transporting the RC/ RPV/ Packaged Waste to Interim Storage

This stage involves moving the ILW from the initial dismantling facility to the point at which it will be stored until the proposed GDF becomes available to the SDP. A summary of the assessments undertaken on the three technical options is shown in **Table 5.7**. A full assessment is provided in Appendix A.

Table 5.7 Generic Assessment Summary for Stage V: Transporting RC/RPV/Packaged ILW to Interim Storage

Option	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
Transport RC	0/-	+/?	0	0	0	0	0	0	0	0	0	0	0	0
Transport RPV	0	+/?	0	0	0	0	0	0	0	0	0	0	0	0
Transport Packaged Waste	0	+/?	0	0	0	0	0	0	0	0	0	0	0	0

Score Key:	+ + **Significant** Positive effect		+ **Minor** positive effect		0 No overall effect		- **Minor** negative effect		- - **Significant** negative effect	? Score uncertain
NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.										

5.7.1 Likely Significant Effects of Moving the RC/ RPV/ Packaged Waste to Interim Storage

No significant positive or negative effects were identified for this stage across any of the three technical options.

5.7.2 Other Potential Effects of Moving the Reactor Compartment into Interim Storage

The extent of the environmental effects for this stage (which includes interim storage itself) partly depends on how far the RC has to travel. If it is kept at or adjacent to the initial dismantling facility (known as the ‘point of waste generation’) then effects would be minimal. However, if the RCs were taken to another coastal location to be stored, the effects could be more pronounced. This assessment has therefore assessed the impacts of moving the RC offsite to ensure that all potential effects are considered.

Moving RCs from the initial dismantling facility to the interim storage facility may require some channel clearance work which could potentially affect aquatic and intertidal environments, generating a negative effect on **biodiversity and nature conservation**. However, this will be highly dependant upon the location(s) and the choice of sea transportation method used.

RC transportation and interim storage has some potential to benefit the **population** objective by creating or supporting a small number of transportation, maintenance and security jobs. The extent to which these posts benefit the local community will depend on recruitment policies of the MOD/ contractors and the extent to which the local labour market can meet the skill requirements.

The loading and unloading of RCs and maintenance activities will generate some noise, vibration and emissions to air although it is expected that these effects would be infrequent, temporary and contained within the dismantling and storage facilities such that they are unlikely to have a measurable effect.

As the storage facilities will be on the coast, operational activities could be affected by coastal flood risks due to extreme weather conditions and long-term sea level rise and it will be important to ensure that the facility is adequately protected from this risk for at least 100 years. Transport emissions from moving the RC by sea (the only viable option for such a large package) would be dependant on the size and age of the vessel(s) and the distance traveled. As only one submarine will be processed per year, emissions will be exceptionally low. The likelihood of any unplanned events such as grounding or sinking of the barge is also considered to be very low.

5.7.3 Other Potential Effects of Moving the Reactor Pressure Vessels and Packaged Waste into Interim Storage

The range of potential effects associated with transporting and storing RPVs and Packaged ILW are largely similar as for the Reactor Compartment. Both RPVs and Packaged ILW could be moved from the initial dismantling facility to the interim storage facility by rail and/or road, both of which would require specialised over-packs to be designed and built for that purpose. This may generate commercial opportunities and so bring (albeit minor) economic benefits.

Emissions from transportation will, amongst other factors, depend upon the total distance traveled and the mode of transport chosen.

5.7.4 Mitigation Measures

The following measures are proposed to avoid or mitigate the potential environmental effects associated with transportation of radioactive materials into (and eventually out of) interim storage.

Proposed mitigation measures for transporting RCs/ RPVs/ Packaged Waste to interim storage
• Minimise the distance travelled by the RCs/ RPVs/ packaged waste, and consider using the most efficient/ least damaging modes of transport (e.g. by train instead of road). • Avoid the use of a heavy-lift ship (or any similar method) to transport the separated RCs, where this would require additional Capital dredging to be carried out. • Ensure that sea transport avoids/ minimises any adverse effects on protected areas and sensitive receptors. • Manage routing and timing of HGVs in and out of site to minimise congestion, disturbance and air quality problems (especially for areas with existing AQMAs.). • Ensure that transport mechanisms and the interim storage facility have emergency response plans to address any potential unplanned events.

5.8 The Environmental Effects of Stage VI - Dismantling RC/ RPV (if required) and Transferring the Packaged Waste to the Proposed GDF

This stage involves moving the ILW from interim storage to the proposed GDF. If the ILW is stored in a way that the GDF cannot accept (e.g. as intact RCs or, potentially, as intact RPVs), they will have to be taken apart and the ILW removed and appropriately packaged into GDF-compliant containers. A summary of the assessments of the three technical options for Stage VI of the SDP process is shown in **Table 5.8**. A full assessment is provided in Appendix A**.**

Table 5.8 Generic Assessment Summary for Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF

Option	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
Option 1: RC Size Reduction and transport	0/-	+/?	-/+	-	0	-	-	-	0	0	+/-	0	0/-	0
Option 2: RPV Size Reduction and transport	0	+/?	-/+	0/-	0	0/-	0/-	-	0	0	0/-	0	0	0
Option 3: Packaged Waste transport	0	0	+/0	0	0	0	0	0	0	0	0	0	0	0

Score Key:	+ + Significant Positive effect	+ Minor positive effect	0 No overall effect	- Minor negative effect	- - Significant negative effect	? Score uncertain
NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.						

5.8.1 Likely Significant Effects of Size Reducing the RC/ RPV (if required) and Transferring Packaged Waste to the Proposed GDF

No significant positive or negative effects were identified for this stage across any of the three technical options.

5.8.2 Other Potential Effects of Size Reducing the Reactor Compartments and Transporting the Packaged Waste

This stage will be very similar to the packaged ILW option in Stage III, whereby the RC will be size reduced, the ILW packaged into GDF-compatible, $3m^3$ containers, the LLW suitably packaged and the rest of the materials recycled or disposed of. The major difference would be that this will be taking place after interim storage, not before it. In addition, this stage also involves the ILW being transported to the proposed GDF, the LLW being transported for disposal and the other wastes being transported off-site as required. As a result, the range of potential effects was found to be broadly similar to Stage III, although the magnitude of those effects was found to vary slightly.

Biodiversity and Nature Conservation

The removal of RPVs from the RC is associated with a slight risk of accidental release of pollutants into the environment, with indirect effects on biodiversity. However, SDP activities would be closely regulated, subject to stringent environmental permitting requirements with Best Available Techniques (BAT) principles adopted, so this risk is considered to be very low.

Depending on where the RCs are stored and where they are to be finally dismantled, they may need to be transported once again. If this were the case, it may again be necessary to undertake some channel clearance work which could potentially affect marine biodiversity. However, this will be highly dependant upon the location(s) and the choice of sea transportation method used.

Population

Dismantling the RCs to Packaged Waste could generate economic benefits through the creation of jobs and investment in local supply chains, although any such benefits would be limited in view of the small scale of the works.

Health and Wellbeing

Dismantling the RC after interim storage would allow the radioactive isotopes to decay for the longest possible time, minimising worker dose. The main driver for worker dose is the radioisotope Cobalt 60, with a half-life of 5.25 years; after 50 years of storage, its activity will fall by a factor of a thousand. The slight negative score reflects the small residual level of radioactivity from Co60, coupled with the continued presence of longer-lived isotopes such as Nickel 63 and Iron 55. It also reflects the inherent health and safety risks for workers that could be expected from such a heavy industrial process.

However, neither the public nor other dockyard workers would be expected to receive any planned radioactive dose from dismantling the RC. No releases of radiation into the environment are expected during transport of the Packaged Waste or LLW, because of the strict transport regulations that are (and are expected to remain) in place for the movement of radioactive materials. The risk of accidental radioactive discharges into the wider environment would be very low, especially as the components are mainly solid and radioactivity levels would have dropped considerably, as already described.

By contrast, slight positive effects were identified by the removal of the RC legacy and the potential that this would have to reduce any residual anxiety within the community.

Noise and Vibration; Air; Water

The dismantling of the 27 RCs would be expected to create some noise and vibration, alongside the small, controlled releases to air and water that would be expected with metal-cutting processes. Transportation of the ILW packages to the proposed GDF and movement of the LLW and residual waste and recyclate streams would result in transport-related discharges (NOx, CO_2 and particulates) to air, although adverse effects would not be expected on the transport objective, due to the relatively small number of foreseeable vehicle movements.

Operational activities will also increase demand for water (associated with cutting, dust suppression and damping down) which may have a small negative effect on local water resources.

Climate Change and Energy Use

Dismantling the RCs and transporting the packaged ILW to the proposed GDF will use energy. This may be partially offset by postponing RC dismantling to Packaged Waste until after interim storage, due to the potential for developments in less energy intensive techniques. Delay will also have the benefit of using energy with lower carbon emissions, reflecting the assumption that when dismantling will take place (post 2030), the UK electricity network will have substantially decarbonised in line with the Climate Change Act (2008) targets. Overall, this option has been assessed as having a minor negative effect.

Waste

Delaying RC processing will allow radioactivity levels to fall substantially. This could allow some of the ILW dominated by short-lived isotopes to decay to LLW, although this is not expected to significantly decrease the volume of ILW that will need to be disposed of. Processing the 700-1000 tonne RC is also likely to generate non-radioactive hazardous wastes as well as a large volume of materials that will be recycled. Overall, the option is therefore expected to have a mixed (minor positive and negative) effect on waste.

Cultural Heritage

There is a small potential for a minor negative effect on cultural heritage features arising from any operations to remove the RPV from the RC. There may also be negative effects on buried archaeological remains on the adjacent seabed should channel clearance work be required, although again this will be highly dependant upon the location(s) and the choice of sea transportation method used.

5.8.3 Other Potential Effects of Size Reducing the Reactor Pressure Vessels and Transporting the Packaged Waste

The range of potential effects of size reducing the RPV to Packaged Waste was found to be broadly similar to those for the Reactor Compartment; however, their magnitude is generally smaller, reflecting the fact that the RPV will have already been removed from the RC during Stage III, so there would be no residual RC to dismantle and dispose of.

Regarding **health and wellbeing,** worker dose during RPV size reduction would be low, reflecting the fact that removal of the RPV would have already been completed, and the requirement to undertake size reduction work in radiologically shielded facilities. Once again, the public or other dockyard workers would not be expected to receive any planned or accidental radioactive dose from dismantling activities.

5.8.4 Other Potential Effects of Transporting Packaged Waste

This option has been assessed as having a largely neutral effect on all of the assessment objectives. This reflects the fact that all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage III of the SDP process) and, consequently, the only activity which could have any environmental effects is transporting the packaged (solid) ILW to the proposed GDF. The packages will need to be transported within strict mandatory safety controls, entailing the use of transport over-packs, to minimize any risk of radioactivity reaching the environment, even in the event of a major accident.

The project assumes that two of these over-packs will be made for this purpose. As a high end estimate, if all packages were to be moved over a period of 1 year, transport movements would occur approximately 4 times per week. This would be unlikely to affect the environment, although it is recognised that this would be dependant on the route(s) used, the timing of the movements and the proximity of sensitive receptors. The minor positive effect on health again reflects the removal of the radioactive materials from interim storage into the purpose-built national facility.

5.8.5 Mitigation Measures

The mitigation measures for this stage of the SDP are covered above, so do not need to be repeated here. The proposed mitigation measures for size reducing the RC/ RPV are addressed in Stage III (docking the submarines and removing the radioactive materials), at Section 5.5.5. Those related to transferring the packaged waste to the proposed GDF are covered in Stage V (transporting radioactive materials to interim storage) at Section 5.7.4.

5.9 The Environmental Effects of Stage VII - Decommissioning SDP Facilities

This stage involves decontaminating and taking apart the facilities for initial dismantling and interim storage, and restoring the land to its original state. A summary of the assessments for these three generic 'original states' is shown in **Table 5.9**. A full assessment is provided in **Appendix A.**

Table 5.9 Generic Assessment Summary for Stage VII: Decommissioning the SDP Facilities

Option	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
Option 1: 'greenfield' site	-/ ++	-/ ++	-/+	-/+	0/+	--/+	-/+	-/+	0	--/+	--/ ++	-/ ++	-/+	-/ ++
Option 2: 'brownfield' site	-/+	-/ ++/ ?	-/+	-/+	0/+	-/+	-/+	-/+	0	-/+	-/+	0	-/+	0
Option 3: 'existing' Licensed/ Authorised site	-/+	-/ ++/ ?	-/+	-/+	0/+	-/+	-/+	-/+	0	-/+	-/+	0	-/+	0

Score Key:	**+ +** **Significant** Positive effect		**+** **Minor** positive effect		**0** No overall effect		**-** **Minor** negative effect		**- -** **Significant** negative effect	**?** Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

5.9.1 Likely Significant Effects of Returning the Site to an Undeveloped, 'Greenfield' State

Biodiversity and Nature Conservation

Decommissioning and restoration of SDP sites to their original greenfield state will require the removal of all hard-standing, buildings and infrastructure. However, it is assumed that the biodiversity value of the SDP sites following operation will be low. As a result, it is likely to cause minor short-term disturbance to biodiversity, but result in significant long term positive effects as the greenfield land is reinstated. There may be an opportunity during restoration activities to enhance the sites to support greater biodiversity levels than those prior to development, for example, through introduction of new habitats or landscape design.

Population

Decommissioning is expected to generate a range of job opportunities, with potentially significant associated economic benefits in the short term. The extent to which any benefits are felt locally will depend on the type of posts created, the characteristics of the local labour market and the recruitment/ procurement policies of the contractors. In longer term, the closure of SDP facilities would affect the viability of the operational jobs on the site and hence affect the local economy (depending on the economic context of the site). However, SDP operations are not expected to support a significant number of jobs, so the long-term effects are unlikely to be particularly significant.

Water

Water would be required throughout decommissioning for use in activities such as demolition, dust suppression and land remediation as well as for potable purposes. Following completion of decommissioning activities, there would be no further use of water associated with SDP activities. This is expected to have a minor positive effect on water resources in the long term.

Decommissioning would generate several sources of water requiring discharge, including surface run-off, groundwater from dewatering, any effluent arising from water use on site and foul water. This could affect the water quality and/or rate of flows of receiving waters. Containment mechanisms would need to be in place to prevent the accidental discharge of any radiological or other hazardous contaminants to the environment, and over the long term, it is expected that returning SDP sites to a greenfield state will help to improve water quality in the local area. There may also be an opportunity to enhance aquatic and intertidal environments during restoration activities.

Transport

Decommissioning and restoration of SDP sites to 'greenfield' is likely to significantly increase transport movements, congestion and associated accident risks on the local road network. This reflects the high volume of waste/recyclate materials to be transported off site as well as the movement of demolition workers and deliveries. However, in the longer term the cessation of operational activities is expected to have a small positive effect on the transport objective by reducing the volume of associated traffic.

Waste

Demolition and decommissioning of SDP facilities is expected to generate large amounts of demolition wastes including aggregates of varying size and composition, soil and spoil. However, it would be expected that the majority of the primary wastes arising could be reused or recycled.

There will also be low and possibly intermediate-level radioactive wastes produced from the dismantling of the size reduction facility, and in particular associated with the 'hot cell' (the radiologically-shielded facility where the radioactive metals are cut up) which is likely to include steel and concrete as well as contaminated size reduction tools and equipment. This will need to be packaged and transported off-site. At this stage, the quantities of waste are unknown but are not anticipated to be significant.

Land Use and Materials

Decommissioning and restoration activities would remove all buildings and supporting infrastructure and contaminated land would be subject to remediation. This would serve to re-establish current land use patterns and recreate green space lost as a result of the development of SDP facilities, generating a significant positive effect on this objective. However, restoration to background may undermine the potential to make best use of the facilities; for example, there may be opportunities as part of any facility review to refit the facilities for the dismantling of further submarines.

Landscape and Townscape

Decommissioning activities are expected to generate similar effects on landscape and townscape to those associated with the construction of SDP facilities (e.g. impacts resulting from the introduction of new visual elements into the landscape). In the longer term it is expected that restoration works will significantly enhance local landscape and townscape character as surface facilities, infrastructure and decommissioning plant are removed.

5.9.2 Other Potential Effects

Overall, there are likely to be mixed (but not significant) effects on the SEA objectives for **health**, **noise and vibration**, **air quality** and **cultural heritage.** This is primarily due to the short-term effects of decommissioning works and traffic and the long-term positive effects associated with the cessation operational activities. This option has also been assessed as having a mixed effect on **climate change and energy use** due to emissions of CO_2 from plant and decommissioning traffic, which are likely to be higher than for the other generic land use options, given the extent of decommissioning activity required.

5.9.3 Likely Significant Effects of Returning the Site to an Undeveloped, 'Brownfield' State

Population

Similar to the 'greenfield' option, in the short term, decommissioning is expected to have a significant positive effect on the population objective reflecting the scale of the works and the potential for the creation of both jobs and local investment. In the longer term, the closure of SDP facilities could result in an increase in local unemployment (although this is dependent on a number of factors). However, these effects could be in part offset by the development of new economic uses on the site(s). This reflects the objectives of current national planning policy, which seek to direct new economic development towards previously developed land. As the extent of potential future employment creation following decommissioning is unknown, this effect is considered to be uncertain.

Whilst decommissioning will again incur significant 'up front' costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage, so that there will be a net benefit in relation to national public expenditure.

5.9.4 Other Potential Effects

In contrast to the decommissioning of a 'greenfield' site, only minor negative effects have been identified in relation to **biodiversity and nature conservation, health and wellbeing, noise and vibration, water, air, climate change and energy use, transport, waste and cultural heritage**. This reflects the expectation that both the duration and scale of decommissioning works would be reduced, as the hard-standing and some infrastructure would be retained, having been present at the sites prior to development. However, similar to decommissioning of a 'greenfield' site, in the longer term following restoration, there would no longer be any adverse effects associated with operational activities, which is expected to have a minor positive effect on these objectives. There is also potential for this option to positively affect geology and soils should soil quality be improved beyond levels prior to development (e.g. through land remediation on site during decommissioning or by restoring treated contaminated soil removed from site during development).

5.9.5 Likely Significant Effects of Returning the Site to 'Existing' Nuclear Use

Population

In the short term, decommissioning is expected to have a significant positive effect on the population objective due to the potential generation of both jobs and local investment, albeit at a reduced scale relative to the other land use options (commensurate with the more limited scale of works under this option).

In the longer term, once decommissioned, SDP sites may be redeveloped for related or similar licensed uses, creating employment opportunities which could require similar skill sets to those during the operational phase of the SDP process. This would help offset the short-term negative effects associated with the cessation of operational activities. However, the potential for these benefits to be realised depends on the duration of decommissioning activities vis-à-vis the loss of specialist skill sets in the local labour market over time and the type of redevelopment which takes place. Consequently any effects are considered to be uncertain.

Whilst decommissioning will again incur significant 'up front' costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage, so that there will be a net benefit in relation to national public expenditure.

5.9.6 Other Potential Effects

Similar to decommissioning on a previously developed site, the potential for mixed (minor positive and negative) effects has been identified for **biodiversity and nature conservation, health and wellbeing, noise and vibration, water, air, climate change and energy use, transport, waste** and **cultural heritage.**

Depending on the extent to which the Licensed/Authorised site contained any soil contamination prior to development, there may be an opportunity to improve the soil quality to a greater level than the existing baseline. This may be achieved through either in-situ remediation during decommissioning, or by returning any previously contaminated but now cleaned-up land that was removed during development back to the site.

5.9.7 Influence of Technical Options for Removing the Radioactive Materials on the Severity of Effects

All three technical options will ultimately require the ILW to be packaged for disposal to the proposed GDF. Consequently, it is assumed that the total footprint of the initial dismantling facilities to be decommissioned will be similar (between 15,000 and 20,000 square metres) across all options.

The RC storage option will require decommissioning of a relatively large interim storage facility compared to the other technical options. Consequently, it is expected that the level of demolition/ land excavation and volume of traffic movements would be greater for this technical option and, therefore, the magnitude of effects (both positive and negative) arising from decommissioning would also be increased, relative to the RPV and Packaged Waste options.

Decommissioning the RC storage facility on a greenfield site would entail removal of docking facilities (amongst other supporting infrastructure). This would serve to further increase the scale of decommissioning works and, therefore, the potential magnitude of adverse effects. Removal of waterside facilities may also increase the severity of any negative effects on objectives related to **biodiversity and nature conservation** and **water** (due to the potential affect on marine and intertidal environments during decommissioning) although it is assumed that restoration following removal of docking facilities would help mitigate any adverse impacts.

The requirement for a RC storage facility to be coastally located may give rise to the risk of coastal inundation, sea level rise or extreme weather conditions disrupting decommissioning activities which could have a negative effect on objectives related to **climate change and energy use** and **coastal change and flood risk**. However, under this option there may be potential to retain coastal defences developed during construction.

5.9.8 Mitigation Measures

The following measures are proposed to avoid or mitigate the potential environmental effects associated with decommissioning the initial dismantling and interim storage facilities.

Proposed mitigation measures for decommissioning the SDP facilities
• Many of the proposed measures cut across a number of assessment objectives and include: • Determine the historic value of the site(s) at the earliest stage and take appropriate steps to address any issues arising. This would only be needed if the facilities had become important landmarks in their own right. • Limit noise, vibration dust and mobilisation of any contaminants during demolition as part of a Demolition Environmental Management Plan (DEMP). • Continue using a Site Waste Management Plan and a waste minimisation strategy to identify waste streams and to maximise the amount of materials recycled.

Proposed mitigation measures for decommissioning the SDP facilities
• Inform the public of developments on an ongoing basis, e.g. by attendance by community meetings. • Seek to use local workers and suppliers where possible. • Consider using mains electricity to power equipment and plant, to minimise air pollution from diesel and oil-powered demolition plant. • Manage traffic movements to minimise disturbance, congestion and air quality problems (especially for areas with existing AQMAs.) The potential for using shipping to move demolition materials/ wastes should be explored. • All of the above should be included in any tender specifications for demolition contracts.

5.10 Conclusions

The SEA has considered the generic environmental effects that could arise at each of the seven stages of the SDP.

5.10.1 What are the Significant Effects of the Three Generic Land Use Categories?

This assessment has considered the potentially significant environmental effects of **Stages I and II**-developing and eventually decommissioning SDP facilities on three generic land types. The purpose of this has been to test whether the MOD's decision[29] to only consider the use of 'existing' Licensed or Authorised sites for reasons of practicality is also supported on environmental grounds.

The effects are largely related to the size and scale of the development, and the type of land used. Some have been found to be significant.

Undeveloped, 'Greenfield' Sites

Siting SDP facilities on undeveloped land has been assessed as having a **significant or *potentially* significant negative effect** on biodiversity and nature conservation, soil and geology, water, climate change and energy use, coastal change and flood risk, transport, waste, land use and materials, cultural heritage and landscape and townscape. The severity of these effects primarily reflects the loss of undeveloped land to development as well as the scale and duration of construction activities. Moreover, it is considered that 'greenfield' sites are likely to be sensitive in terms of biodiversity, soil and landscape quality, so the potential for construction and decommissioning to adversely affect these characteristics could be significant (although it is recognised that this is dependent on the exact nature and characteristics of the sites themselves). Minor negative effects were also identified in relation to health and wellbeing, noise and vibration and air.

Construction and decommissioning activities could bring **significant benefits** the population as a result

[29] *SDP - Our approach to decision making,* February 2011

of the jobs and local economic benefits associated with construction, operation and eventual removal of the facilities.

Overall, using undeveloped 'greenfield' sites is considered to be the worst performing land use option.

Previously Developed, 'Brownfield' Sites

Whilst the type of effects were broadly similar to those of 'greenfield' sites, their magnitude was found to be far smaller, since the majority of infrastructure needed would be expected to be already in place. As a result, **no significant adverse environmental effects were identified**.

Minor negative effects were identified in relation to noise and vibration, air, climate change and energy use and transport. Constructing SDP facilities on 'brownfield' sites is also expected to generate potentially negative effects on objectives relating to biodiversity and nature conservation, water, waste, cultural heritage, landscape and townscape and health.

It was again found that that employment opportunities and local economic benefits generated during construction and decommissioning may bring **potentially significant benefits** to the population.

'Existing' Licensed/Authorised Sites

Using 'existing' sites Licensed or Approved by the UK nuclear regulators would make the best use of existing personnel, infrastructure and ancillary facilities. As a result, the scale and duration of both construction and decommissioning would be lower than developing a 'brownfield' site where some of these features could be expected, and significantly lower than developing a new 'greenfield' site.

No significant adverse environmental effects were identified. Nevertheless, smaller potential effects were identified in relation to noise and vibration, air, climate change and energy use and transport. Possible construction-related effects were also identified on biodiversity and nature conservation, water, waste and cultural heritage.

Positive effects were identified with respect to land use and materials, given the opportunities to make best use of existing infrastructure and resources. It was again found that employment opportunities and local economic benefits during construction and decommissioning may benefit the population, although the more limited scale of development would reduce the potential significance.

Overall, using 'existing' Licensed or Authorised sites has been assessed as the best performing option, due to the availability of existing infrastructure, facilities and skills.

5.10.2 What are the Significant Effects of the Technical Options for Removing the Radioactive Materials?

The generic assessments have included consideration of the potentially significant environmental effects associated with removing the ILW from the submarines by one of three methods:

All three technical options (removing the RC, removing the RPV and removing and size reducing the RPV to Packaged Waste) require the ILW to be removed from the submarines and ultimately packaged for disposal. Consequently, the total footprint of the initial dismantling facility is broadly similar for each option, so the overall magnitude of construction-related effects was found to be similar. However, these 'technical options' do result in different sized interim storage facilities see **Table 5.10**), which in turn results in differing magnitude of environmental effects

Table 5.10 Comparison of SDP Facility Footprints across the Technical Options

Facility	Approximate Size
Dock-side facilities	12,500m^2 (for all technical options)
ILW and LLW processing facilities	5,000 m^2 (for all technical options)
RC Storage Facility	11,600 m^2
RPV Storage Facility	801 m^2
Packaged ILW Facility	1,005 m^2 (based on an average 6 ILW boxes per submarine)

Separating and Storing the Reactor Compartments

The interim storage of RCs will require construction of the largest of the three interim storage facilities, so the scale and duration of environmental effects associated with construction and decommissioning would be the greatest of the three technical options; **some adverse effects would be significant**. Development on a 'greenfield' site will have the most significant effects as all of the infrastructure would have to be developed.

Any dredging required to move the RCs or separated submarines would have the potential to significantly affect biodiversity, due to impacts on aquatic and intertidal environments. The need for the RC storage facility to be coastal may also increase the potential for adverse effects from coastal inundation, sea level rise or extreme weather conditions. Its scale and built form (and the requirement for heavy lifting infrastructure) may give rise to potentially significant negative effects on landscape and townscape and on cultural heritage.

Minor negative effects have been identified for noise and vibration, geology and soils, water, climate change and energy use, transport and cultural heritage due to impacts arising from RC separation and subsequent processing. The overall range and magnitude of negative effects during initial dismantling is less than for the other technical options, which principally reflects the limited scale of work at the front end of the process. However, further adverse effects would be generated when the stored RC is eventually size reduced to Packaged Waste for disposal to the proposed GDF.

This option does allow for maximum in-situ decay of short lived isotopes such as Co60, and has the lowest expected radiological dose to workers of all the technical options. The overall risk of accidental discharges of radiological contaminants is considered to be very low. Operational activities are also expected to generate some positive effects on population from employment opportunities and the potential for local economic benefits.

Overall, separation and storage of RCs is considered to be the worst performing option from an environmental perspective, largely due to the size of the RC storage facility needed.

Removing and Storing the Reactor Pressure Vessels

RPVs will require construction of a much smaller interim storage facility than the RC option, so the environmental effects associated with this option are of far less magnitude. **No significant environmental effects were identified.**

The radiological dose to SDP workers, and the (already remote) risk of accidental discharge of radiological contaminants to the environment, could be marginally higher than for RC separation during initial dismantling, since more intrusive activities would be undertaken 'up-front' under this option (although the interim storage of RPVs again allows for the in-situ decay of short lived isotopes.)

Overall, removal and storage of RPVs is considered to be the best performing option, as it requires the smallest storage facility of the three options, yet allows maximum radioactive decay to take place before size reduction.

Removing the RPVs, Size Reducing them and Storing the Packaged Waste

The interim storage facility for Packaged Waste would be slightly larger than the RPV storage facility, but significantly smaller than the RC storage facility. Hence, the range of effects was found to be similar to that of RPV removal, and **no significant environmental effects were identified.** As ILW packages are likely to be transported by either road or rail, there will be no need for the interim storage facility to be coastally located or for the provision of docking facilities and dredging, avoiding any associated environmental effects.

No significant environmental effects have been identified under this option. As the RPV would be size reduced and the ILW packaged 'up front' it is expected that operational-related effects would be greater in the short term relative to the other technical options, although there would be no further effects in the longer term, as the ILW would have already been fully processed.

The risk of unplanned radiological discharges during initial dismantling is predicted to be slightly higher than for the other technical options; however the expected worker doses would be similar to RPV removal. These are both the result of this option involving the most intrusive work on the reactor at an early stage. Notwithstanding this, worker doses and discharges are predicted to remain significantly below statutory exposure limits. There is also less opportunity to benefit from the effects of isotope decay as full processing would be undertaken prior to interim storage.

5.10.3 What are the Significant Effects of the Other Stages?

For **Stage IV** (dismantling the residual submarines and processing wastes), a significant positive and negative effect was identified with respect to waste, reflecting the volume of waste likely to be generated during the recycling of submarine hulls, the fact that the vast majority of this material could be recycled, and the overarching benefit of dealing with the legacy of laid-up submarines. It was found that processing the scrap materials at the initial dismantling site performed significantly worse than sending the submarines to a specialist UK ship recycling facility.

For **Stage V** (transporting the ILW to interim storage) the environmental effects were found to be minimal, with the exception of moving Reactor Compartments, since these could require additional dredging, which could potentially affect aquatic and intertidal environments. The transportation of ILW and interim storage could bring benefits from the expected small number of transportation, maintenance and security jobs.

For **Stage VI** (packaging the ILW and transporting it to the proposed GDF) the effects were similar in nature to, though smaller in scale than, those found for initial dismantling. The scale of these effects was in part dependent on the technical options for removing the radioactive material, although none were found to be significant.

6. Assessment of the Integrated Options

6.1 Overview

This section summarises the findings of the SEA assessment on the SDP's integrated options. It also presents the findings of the cumulative effects assessment. The detailed assessment of those potential effects on the 14 environmental topics is presented in **Appendix A.**

6.1.1 Summary of the SDP and SEA Integrated Options

The integrated options are the credible combinations of the following:

- three technical options for removing the ILW:- Reactor Compartment separation, Reactor Pressure Vessel removal or Reactor Pressure Vessel removal with size reduction to Packaged Waste;
- three initial Dismantling Site combinations: Comparison of undertaking initial dismantling (removal of the ILW) at Devonport Dockyard, Rosyth Dockyard, or at both; and
- four types of ILW Storage site: Comparison of storing submarine ILW at the Point of Waste Generation, and at 'remote' sites owned by MOD, the Nuclear Decommissioning Authority (NDA) or Commercial operators.

The combination of these options has resulted in the following eight broad option groupings (shown in **Table 6.1**). Each has three siting variants for initial dismantling and interim storage, giving 25 variants in total.

Variants designated by a "D" (e.g. Variant 2D) indicate that the submarines would all undergo initial dismantling at Devonport. Variants designated by an "R" (e.g. Variant 2R) indicate that the submarines would all undergo initial dismantling at Rosyth Dockyard. Finally, the variants designated by a "B" (e.g. Variant 2B) indicate that the submarines would undergo initial dismantling at both Devonport Dockyard and Rosyth Dockyard. This terminology reflects the approach used in the Integrated Options analysis and the subsequent Multi-Criteria Decision Analaysis (MCDA) process.[30]

It is re-emphasised that all the options provide cradle-to-grave solutions with the exception of Option 0, 'Do Minimum', which only provides a continued afloat storage solution until *at least* 2070.

[30] *SDP - Our approach to decision making,* February 2011

Table 6.1 Summary of the SDP Integrated Options

Integrated Option Grouping	Variants
Option 0: Do Minimum	None
Option 1: RC separation with interim storage at the point of waste generation and at a later date size reduction of ILW, before transfer to the proposed GDF	Variant 1D : Devonport Dockyard Variant 1R: Rosyth Dockyard Variant 1B: Devonport Dockyard and Rosyth Dockyard
Option 2: RPV removal with interim storage at the point of waste generation and at a later date size reduction of ILW, before transfer to the proposed GDF	Variant 2D: Devonport Dockyard Variant 2R: Rosyth Dockyard Variant 2B: Devonport Dockyard and Rosyth Dockyard
Option 3: RPV removal with interim storage at a 'remote' commercial site, and at a later date size reduction of ILW, before transfer to the proposed GDF	Variant 3D: Devonport Dockyard Variant 3R: Rosyth Dockyard Variant 3B: Devonport Dockyard and Rosyth Dockyard
Option 4: RPV removal with interim storage at a 'remote' MOD site, and at a later date size reduction of ILW, before transfer to the proposed GDF	Variant 4D: Devonport Dockyard Variant 4R: Rosyth Dockyard Variant 4B: Devonport Dockyard and Rosyth Dockyard
Option 5: RPV removal and size reduction to form Packaged Waste, with interim storage at the point of waste generation	Variant 5D: Devonport Dockyard Variant 5R: Rosyth Dockyard Variant 5B: Devonport Dockyard and Rosyth Dockyard
Option 6: RPV removal and size reduction to form Packaged Waste, with interim storage at a 'remote' commercial site:	Variant 6D: Devonport Dockyard Variant 6R: Rosyth Dockyard Variant 6B: Devonport Dockyard and Rosyth Dockyard
Option 7: RPV removal and size reduction to form Packaged Waste, with interim storage at a 'remote' MOD site	Variant 7D: Devonport Dockyard Variant 7R: Rosyth Dockyard Variant 7B: Devonport Dockyard and Rosyth Dockyard
Option 8: RPV removal and size reduction to form Packaged Waste, with interim storage at a 'remote' NDA site(s).	Variant 8D: Devonport Dockyard Variant 8R: Rosyth Dockyard Variant 8B: Devonport Dockyard and Rosyth Dockyard

When reviewing the above options in the MCDA assessment, it became apparent that there were a number of common features that would enable these **eight** groups to be consolidated into **five broad groupings** for the purpose of the SEA, in order to simplify it. These are as outlined in **Table 6.2**.

Table 6.2 Summary of revised Integrated SEA Options groupings

SDP Integrated Option	Justification	Revised SEA Integrated Option Title	Variants
Option 0: Do Minimum	N/A	**SEA Option 0** (no change)	

SDP Integrated Option	Justification	Revised SEA Integrated Option Title	Variants
Option 1: RC separation and storage at the point of waste generation and at a later date size reduction of ILW, before transfer to the proposed GDF	This is the only feasible option for RC storage.	**SEA Option 1** (no change)	**1D (Devonport)** **1R (Rosyth)** **1B (both sites)**
Option 2: RPV removal with interim storage at the point of waste generation and at a later date size reduction of ILW, before transfer to the proposed GDF	This option relates to storage on-site, so does not need to change.	**SEA Option 2** (no change).	**2D (Devonport)** **2R (Rosyth)** **2B (both sites)**
Option 3: RPV removal with interim storage at a 'remote' commercial site generation and at a later date size reduction of ILW, before transfer to the proposed GDF Option 4: RPV removal with interim storage at a 'remote' MOD site, and at a later date size reduction of ILW, before transfer to the proposed GDF	These two options relate to off-site storage where additional transport would be required. Site ownership is of no relevance to the environmental assessment.	**SEA Option 3/4**: RPV removal with storage at a 'remote' site.	**3/4D (Devonport)** **3/4R (Rosyth)** **3/4B (both sites)**
Option 5: RPV removal and size reduction to form packaged waste, with interim storage at the point of waste generation	This option relates to storage on-site, where no transport is required.	**SEA Option 5** (no change).	**5D (Devonport)** **5R (Rosyth)** **5B (both sites)**
Option 6: RPV removal and size reduction to form packaged waste, with interim storage at a 'remote' commercial site: Option 7: RPV removal and size reduction to form packaged waste, with interim storage at a 'remote' MOD site Option 8: RPV removal and size reduction to form packaged waste, with interim storage at NDA site(s).	These three options relate to off-site storage where additional transport would be required. The potential for new infrastructure on a MOD or Commercial site (but not an NDA site) will be included in the assessment.	**SEA Option 6/8**: RPV removal and size reduction to form packaged waste, with interim storage at a 'remote' site.	**6/8D (Devonport)** **6/8R (Rosyth)** **6/8B (both sites)**

The assessment has focused on evaluating the potential environmental effects of the five integrated option groupings, plus the 'do minimum' option. Undertaking the assessment of these options was considered the most useful way in which the SEA could adequately support the SDP decision making process whilst assessing the range of options (i.e. the SEA's 'reasonable alternatives') for the SDP proposals.

6.1.2 Assumptions for the Integrated Options Assessment

Table 6.3 summarises the assumptions that have been used in the assessment of the integrated options.

Table 6.3 Summary of Key Assumptions for the Integrated Options Assessment

Category	Assumption Description
Site Constraints	It is assumed that there is land within the existing dockyards to accommodate new development. No further land take outside of the existing dockyards would be required.
	Taking account of the facilities and infrastructure within the boundary of the existing nuclear licensed sites at the Devonport and Rosyth dockyards, both dockyards require: • Dock bottom infrastructure. This includes a temporary enclosed structure lying adjacent to the submarine providing access to the submarine, pollutant containment and ventilation. Additional infrastructure includes cradles, a docking trolley and an effluent tank. Collectively this infrastructure is termed a Dock Bottom Village (DBV). • Dockside facilities. These include pick-up, set down, access, scrap/ waste handling and craneage. • ILW and LLW processing, conditioning and packaging facilities. • ILW storage and consignment plant. The Active Waste Accumulation Facility (AWAF) at Rosyth dockyard means that Rosyth has a greater capability for additional Low Level Waste (LLW) processing than Devonport dockyard.
Design and footprints	**Initial dismantling and size reduction facility** It is assumed that initial dismantling facilities would not differ greatly between the options, albeit a hydraulic lift would be required for the 1,000 tonne RC, whilst a crane would be needed to remove the ca. 130 tonne RPV and Primary Shield Tank. It is not expected that there is any difference in size reduction and segregation facility provision between the technical options. The footprint of the docking and initial dismantling facility is assumed to be 7,500m^2. The footprint of the size reduction and segregation facility is assumed to be an estimated 8,500m^2 for all of the technical options. No other design specifications for the size reduction and segregation facilities are available at this stage.
	Interim storage facility For all of the options it is assumed that ILW storage areas would need to be constructed. • **RC storage** will require a facility with an area in the region of 11,600m^2 • **RPV storage** will require a facility with an area of 801m^2 . • **Packaged ILW ('PW') storage** will require a facility with an area of 1,005m^2 .
Construction phasing	It is assumed that the construction of facilities would be phased depending on the technical option: • **For the RC option** there would be two phases- an initial construction phase would comprise construction of facilities for dismantling and interim storage only. Construction of segregation and size reduction facilities would not take place until the interim storage period is nearing completion. • **For the RPV options** there would be two phases– an initial construction would comprise construction of facilities for initial dismantling and interim storage. The construction of segregation and size reduction facilities would not take place until the interim storage period is nearing completion. • **For the PW options** all SDP facilities would be constructed prior to RPV removal.
Radioactive	LLW volumes are assumed to be in the order of between 91 tonnes and 154 tonnes per submarine (between

Category	Assumption Description
waste volumes	2,457 and 4,158 tonnes of LLW in total for 27 submarines). It is estimated between 4 to 44 tonnes of LLW would be disposed of, with the remainder being decontaminated and recycled. ILW volumes are estimated to be between 19 and 58 tonnes per submarine (513-1,566 tonnes of ILW in total for 27 submarines). This would be packaged in $3m^3$ boxes for disposal in the proposed GDF, although the potential for whole RPV disposal has been included as an opportunity.
Waste arisings	When ILW and LLW/ vLLW will be created will depend on the technical option: • **For the RC option**, as the entire RC would be separated and stored, waste arisings at the initial dismantling stage would consist of general wastes. Any LLW and ILW would be contained within the RC, which would be placed into interim storage at the point of waste generation. Following interim storage, the RC would be fully dismantled; the ILW will be packaged and disposed of in the proposed GDF, LLW would be disposed of to a Licensed site (e.g. the LLWR), and the vLLW would be managed as conventional waste. • **For the RPV option**, as the RPV would be removed from the submarine, it is assumed that waste arisings at the initial dismantling stage will consist of general wastes and some LLW/ vLLW. Following interim storage (either on site or at a remote site), the RPV would be fully cut apart (size reduced), and the ILW and LLW/ vLLW managed as above. • **For the Packaged Waste option**, the RPV would be size reduced following its removal; waste arisings for disposal would therefore consist of general wastes, ILW, LLW and vLLW. All LLW would be sent to a licensed disposal facility, and the ILW placed into interim storage (either on site or at a remote site). Following interim storage, the RPV would be size reduced, and the ILW and LLW/ vLLW managed as above. It is assumed that there would be no difference in the final Packaged Waste volumes between the options; radioactivity levels of ILW would reduce over time, but the presence of long-lived isotopes would prevent any reclassification of ILW.
Employment	It is assumed that dismantling operations would be undertaken by skilled nuclear workers. Broad employee estimates (based on one submarine processed per year) are as follows: • **Separate and store the Reactor Compartment** - The RC option is estimated to require 20-30 Full Time Equivalents (FTE) for initial removal of the RC, up to 5 FTE for RC interim storage, 30-60 FTE for removal of the RPV from the RC following interim storage, 20-30 FTE for RPV segregation, and 5-10 FTE for final packaging of ILW into GDF-compliant packaging. *Between 80-135 FTE in total.* • **Remove and store the Reactor Pressure Vessel** - The RPV option is estimated to require 30-60 FTE for initial dismantling (de-planting and packaging the RPV), up to 5 FTE for RPV interim storage, 20-30 FTE for RPV segregation, and 5-10 FTE for final packaging of ILW into GDF-compliant packaging. *Between 60-105 FTE in total.* • **Remove and store Packaged Waste** - The PW option is estimated to require 30-60 FTE for initial dismantling (de-planting the RPV), 20-30 FTE for RPV segregation, 5-10 FTE for final packaging of ILW into GDF-compliant packaging and up to 5 FTE for PW interim storage. *Between 60-105 FTE in total.*
Transport	**Reactor Compartment** In the case of RC separation, initial dismantling could take place at either Devonport or Rosyth or (in the dual site option) at both. Where initial dismantling only occurs at one site, submarines will need to be transported to that site. This could be by either wet or dry tow. Dry tow could be on a heavy lift barge or boat. In the case of the dual site option, once initial dismantling is completed, it is assumed that the separated RCs will be stored at only one interim storage facility. The location of this facility could be at either Devonport or Rosyth. This would require the 27 separated RCs to be transported by sea to the interim storage facility. The 27 RCs would then be transferred from the interim storage facility to the size reduction and segregation facility to be fully dismantled. The resulting packaged ILW would then be transported to the proposed GDF by road or rail.
	Reactor Pressure Vessel For the RPV options proposing interim storage at a remote site it is assumed that 27 RPVs could be transported to the interim storage site by road, rail or sea. It is noted that transport of PWR2 RPVs by rail is unlikely but not yet discounted. Following interim storage and size reduction of the 27 RPVs, the Packaged Waste could be transported to the proposed GDF by road or rail.

Category	Assumption Description
	Packaged Waste Where initial dismantling with storage as Packaged Waste at a remote site is proposed, it is assumed that the 108 – 216 containers of Packaged Waste would be transported from the dismantling site by road or rail to the interim storage site. Following interim storage, the Packaged Waste would be transported to the proposed GDF by road or rail.
	For all options, it is assumed that there will be up to 8 individual movements of Packaged Waste to the proposed GDF per year.
Ship recycling	It is assumed that once the radioactive materials and components have been removed, the submarine hull would be made safe and then transported by sea from the initial dismantling site to the ship recycling facility. No radioactive materials or components (beyond those naturally occurring) would remain on the submarine.
	It is assumed that residual submarine hull dismantling will take place at a commercial UK ship recycling facility. In the case of RC separation, metal plates would be welded onto the ends of the separated fore and aft hull sections to seal them. It is unlikely (but not yet discounted) that the two separated hull sections would be rejoined. The two hull sections would be transported to the ship recycling facility using a heavy lift submersible ship/barge or by wet tow if possible. In the case of the RPV and Packaged Waste options, it is assumed that, following removal of the RPV, metal plates would be welded over all holes cut in the submarine hull to re-establish the submarine's watertight integrity. The submarine would then be floated out of the basin and either wet towed or taken by barge to the ship recycling facility.

6.1.3 Summary of Site Context

Devonport and Rosyth dockyards are well established dockyards, comprising buildings, dockyard infrastructure and hard-standing, dry docks and basins. At both dockyards, there are existing facilities and infrastructure that could be used for SDP activities, although some modification and new build would be required. The dockyards are understood to be similarly equipped for SDP activities, albeit that Devonport dockyard is less well equipped to undertake additional LLW processing and in consequence the level of modification to existing facilities and new development required would be greater.

Devonport dockyard is located in a built up area of Plymouth. It is surrounded by commercial and industrial land uses which lie adjacent to the dockyard, along with residential housing and community facilities. Plymouth City Council has identified the Devonport area as a focus for development and regeneration[31]. In comparison, **Rosyth** dockyard is situated in a less built up and populated area on the edge of the town of Rosyth, with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land.

Devonport dockyard is located next to an area of European conservation importance, the Plymouth Sound and Estuaries Special Area of Conservation (SAC), which comprises a number of Annex I marine habitats and Annex II species sensitive to waterside activities, port development and pollution. **Rosyth** dockyard is within close proximity of the Firth of Forth SPA (a complex of estuarine and coastal habitats), a Ramsar site and SSSI (0.3km at its closest point). There are also several other designated sites in the

[31] Plymouth City Council (2007), Devonport Area Action Plan 2006 – 2021 (adopted 2007)

locality of both dockyards.

Both Devonport and Rosyth are historic dockyards. **Devonport** dockyard comprises 5 scheduled monuments and 85 listed buildings, predominantly in South Yard and Bull Point, and numerous listed buildings, scheduled monuments, Conservation Areas and Registered Parks and Gardens in the surrounding area, including Devonport Registered Park and Garden to the south of the dockyard and Antony Registered Park and Garden across the Hamoaze estuary. There are two listed buildings within **Rosyth** dockyard (the Grade B listed power station and pumping station), both of which are located within the nuclear licensed site; in the surrounding area there are several listed buildings, two Conservation Areas (Pattiesmuir and Inverkeithing) and Rosyth Castle Scheduled Monument. Rosyth is within sight of the historic Forth Bridge.

6.2 The Environmental Effects of the 'Do Minimum' Option

A summary of the assessment of the do-minimum option is shown in **Table 6.4** with commentary provided in the following sections.

Table 6.4 Summary of the Environmental Effects of the 'Do Minimum' Option

Option	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Material Assets (Transport)	K: Material Assets (Waste Management)	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
'Do Minimum'	-/--	--/+	0	-	0	-	-/0	0	-/0	0	-/0	0	0	-

Score Key:	+ + **Significant** Positive effect	+ **Minor** positive effect	0 No overall effect	- **Minor** negative effect	- - **Significant** negative effect	? Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

6.2.1 Likely Significant Effects of the 'Do Minimum' Option

The 'do minimum' option effectively means no change to the status quo- submarines would continue to be stored afloat, but in increasing numbers until all 27 submarines in scope of SDP are out of service.

It is assumed however that submarine dismantling will still eventually need to take place, which will include the need for dismantling facilities (the Investment Appraisal assumes this date to be around 2070 for accounting purposes). In consequence, the range of effects described for the SDP 'do something' options could also be expected to occur at some future point for the ''do minimum' option. As a consequence, the long term and cumulative effects of the do-minimum option on the environment could still be significant.

Biodiversity and Nature Conservation

New dockside infrastructure would eventually be needed at Devonport to accommodate the additional submarines. In addition to building the facilities, some additional dredging would inevitably be required. Changes to water quality could affect the European-protected Plymouth Sound and Estuaries Special Area of Conservation; if the effects were not or could not be mitigated against, they could be significant.

Inspection, maintenance and repair activities will increase over time to ensure the structural integrity of the aging afloat submarines is maintained. However, this work has been assessed as unlikely to affect biodiversity.

Population

The 'do minimum' option implies an indefinite financial commitment to an ever increasing maintenance programme which will be required to maintain the integrity and safety of the 27 out of service submarines. It is understood that current indicative estimates of the maintenance programme for those out of service afloat stored submarines in Devonport is approximately £4 million per year. In addition, the use of scarce quay space would prevent other more labour intensive activities from taking place. This is important at both sites; in Devonport, as the dockyard has reduced in size significantly, with South Yard now being redeveloped for private-sector use. At Rosyth, the site is planned to be redeveloped for commercial activity.

Given the scale and open end nature of this commitment, it is considered that the option would limit funding for investment elsewhere and limit alternative economic activities. As a consequence, over the long term, this would have a significant negative effect on the economic aspects of the population objective.

By contrast, there would be a small positive effect associated with the jobs that would be maintained by the ongoing maintenance requirements. The number of full time equivalent employees (FTEs) required is estimated to be approximately 10% of the SDP totals (between 8 and 13 staff) However, the direct effects on the economy of the increase (or retention) of posts is considered very minor, although there is potential for greater indirect benefits in terms of the income to local suppliers or specialist contractors.

6.2.2 Other Potential Effects

Noise and Vibration

It is expected that the levels of noise and vibration will increase over time, due to increased maintenance and repair activity (such as cutting and welding to repair corrosion) as the submarines age. Given the development proposed in the Devonport Area Action Plan, it is possible that the population immediately adjacent to Devonport may also increase over time. However, the need to adhere to legal and best practice requirements (e.g. BS 5228:2009, Code of Practice for Noise and Vibration Control on Construction and Open Sites) will mitigate this issue to an extent.

Water

Water will be increasingly required for activities associated with preservation (such as damping prior to cutting) as well as for potable purposes during maintenance periods. Over time as the age of submarines and the levels of corrosion increases, it is expected that more repair work and staff will be required for longer periods to maintain structural integrity of the submarines. At Devonport, this increase in water use from current levels is likely to be greater given there will be an additional 10 submarines being laid up at this site. However, the volumes of water required are unlikely to impact on other water abstractors in the area. It is also possible that seawater rather than freshwater could be used for some activities (such as damping) which will reduce water resource demand. It is not expected that the increasing maintenance required over time will have any effects on water quality.

Air Quality

With increasing maintenance and repair work over time there is the potential for slight increases in dust and gaseous emissions from activities such as cutting and welding.

Coastal Change and Flood Risk

Given their waterfront locations, both Devonport and Rosyth dockyards are vulnerable to coastal inundation or sea level rise related to climate change and extreme weather conditions. This could result in damage to facilities or disruption to the maintenance programme, although coastal defences would have to be strengthened to maintain the safety case for the facilities. Eventual construction of further docking facilities at Devonport could slightly change the layout of the waterfront. However, given the range of existing structures present, their form and the existing effects on sediment transfers and coastal erosion patterns, any additional berthing capacity is considered at worst to have a very slight adverse effect.

Waste

The single biggest issue with the ‘do minimum’ option is that it does not deal with the legacy of laid-up submarines or their radioactive materials; this option leaves it to future generations to resolve. However, as this option does avoid the creation of waste (laid-up submarines are not categorised as waste by the Regulators), the score cannot change significantly.

The majority of activities associated with the maintenance regime (such as inspections and underwater structural surveys) will generate no or very little waste. However, repair work inevitably will. As time progresses and the vessels age, the volume of waste generated is expected to increase slightly.

Landscape

Maintenance activities do not need any large scale machinery or heavy lift cranes and so would not be expected to have any effect on landscape or townscape character. However, the eventual indefinite storage of up to 20 submarines at Devonport would present a striking image, and its long term nature could be expected to be considered by some members of the community to affect local landscapes negatively, although it could be argued that such views would be in keeping with the naval heritage of the dockyard.

It is not expected that the ‘do-minimum’ option would have any effects on the health and wellbeing, geology and soils, climate change and energy use, transport, land use or cultural heritage objectives.

6.3 The Environmental Effects of SEA Integrated Option 1: RC Separation with Interim Storage at the Point of Waste Generation

Option 1 involves separating the Reactor Compartments intact from the submarines and storing them on site. In the case of Option 1D, the submarines at Rosyth would be moved by sea to Devonport prior to initial dismantling. For 1R, all the submarines would be collected together at Rosyth. For Option 1B, the submarines would undergo initial dismantling 'in situ' and the RCs would be stored at one of the sites. 1R would necessarily involve some of the RCs being transported by sea from Devonport to Rosyth or vice-versa. After interim storage, the RCs would be size-reduced and the ILW packaged for transfer to the proposed GDF.

A summary of the assessment of Option 1 is shown in **Table 6.5** with commentary provided in the following sections. A full assessment is provided in **Appendix A.**

Table 6.5 Summary of the Environmental Effects of SEA Integrated Option 1

SEA Option Name	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
1D	--/?	-/+	-/0	-	-/?	-	-	-/?	-/0	-	-/+	-/+	-	-/ --
1R	-/0	-/+	-/0	-	-/?	-	-	-/?	-	-	-/+	-/+	0	-/--
1B	--/?	-/+	-/0	-	-/?	-	-	-/?	-/0	-	-/+	-/+	-/0	-/--

Score Key:	+ + Significant Positive effect		+ Minor positive effect		0 No overall effect		- Minor negative effect		- - Significant negative effect	? Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

6.3.1 Likely Significant Effects of SEA Option 1: RC Separation with Interim Storage at the Point of Waste Generation

Biodiversity and Nature Conservation

It is not yet certain how the submarine sections would be transported once the RC is removed, or indeed how the RC itself would be moved to the interim storage site, in the case of the dual site option.

Transport options include ‘wet towing’ the residual hull sections, taking the structures from the dock on a near-shore barge and transferring them onto an ocean-going heavy lift vessel, or a combination of both.

The area of Plymouth Sound within the break-water has a restricted depth of water away from the main shipping channels. **If** transportation by heavy lift vessel were needed (and the existing deepwater channels could not be used for operational reasons), an area of approximately 300m wide and 22-25+ metres deep within the breakwater would potentially need to be created by dredging the seabed, to create sufficient deep (and calm) water to effect the transfer. This is estimated to produce approximately 706,000 tonnes of dredged material (compared to existing maintenance dredging in the Lower Tamar, which produces between 5,000 to 200,000 tonnes of sediment per year). Dredging at this scale within the Plymouth Sound and Estuaries SAC would be likely to have a significant effect on the marine environment and ecosystems through direct loss of benthic species, mobilisation of contaminated sediment and alterations to water quality, currents and waves and estuary morphology.

In the case of Rosyth dockyard, there is sufficient depth in the Firth of Forth Estuary at Rosyth dockyard to accept a heavy lift vessel without any channel modification or dredging. As a result, no significant impacts are anticipated from transportation at Rosyth.

It is recommended that if initial RC dismantling at Devonport is part of the option taken forward, transport options for moving the fore and aft sections and/or the RCs are selected that avoid the need for additional Capital dredging and subsequent damage to Plymouth Sound and Estuaries SAC (and its associated conservation objectives). If, however, after investigation, there is no alternative to using heavy lift vessels in the Sound and dredging is required to facilitate movement, the proposals should be subject to further assessment in line with the Habitat Regulations requirements.

Given the existing land use, SDP shore-side operations at Devonport and Rosyth are not anticipated to result in any direct loss of protected or notable habitats. However, there is the potential for SDP activities at both sites to directly or indirectly affect the marine environment, including internationally and nationally designated conservation sites. This could occur as a result of:

- accidental release of pollutants during construction, such as silty run-off or spilled fuel and oils;
- accidental release of pollutants and/or radioactive materials during initial dismantling; and
- accidental release of pollutants and/or radioactive materials when the RC is eventually dismantled.

However, SDP activities would be closely regulated, subject to stringent environmental permitting requirements with Best Available Techniques (BAT) principles adopted, so the risk of unplanned discharge is considered to be very low. There would be minimal risk of effects on wildlife or habitats from any permitted discharges during normal operations, given that permitted levels are already low and that the activities are expected to remain well below permitted levels.

Landscape and Townscape

Neither Devonport nor Rosyth dockyards are themselves located within designated areas of landscape value and are of long-standing industrial character. However, there is the potential for introduction of new buildings and structures to impact on the character of the surrounding area, including protected/ designated landscapes and townscapes. For Devonport these include the Devonport Conservation Area and views from Rame Peninsula (part of the Tamar Valley Area of Outstanding Natural Beauty (AONB).

For Rosyth, these include the Broomhall/ Belleknowes Area of Great Landscape Value (AGLV) and the Forth Shore AGLV. In particular, the construction of a large (11,600 m^2) facility for the storage of up to 27 Reactor Compartments within either dockyard is likely to have a significant visual impact, given the visibility of both sites from the surrounding areas.

6.3.2 Other (Minor) Potential Effects of Option 1

Population

Estimates of the number of jobs created from construction and eventual decommissioning of the facilities have not been available the initial investment in facilities could benefit the local economy (e.g. by using local companies and local labour etc). However, given the scale of development required and the timescales over which activities would occur, such effects are not anticipated to be significant.

The operational activities associated with separating and storing the RCs would support between 80-135 FTE jobs within the local area for the duration of the SDP. Devonport and Rosyth are both licensed for nuclear activities and conduct similar activities to those required for some aspects of the SDP, so there is a pre-existing pool of appropriately skilled individuals available. It is not possible to state at this stage whether these jobs would be new or would protect existing jobs in the dockyard(s).

There is a risk that suitably qualified and experienced workers would no longer be available to undertake the final dismantling of the RC, given the potential 30-50 year gap between the two activities. This potential loss of skills and experience would have a small negative effect on the population objective. It would be most acutely felt at Rosyth, where other nuclear work no longer takes place. .

There would be some localised community disturbance experienced arising from construction activities and associated traffic movements including noise, vibration and emissions predominantly affecting areas around the dockyards and alongside local transport networks.

Of the site options, Option 1B could have a more positive effect than Options 1D or 1R, as undertaking SDP activities on both dockyards would generate additional construction employment opportunities and would benefit two local economies (although this is unlikely to be the most economically efficient solution as economies of scale would not be realised and facilities would be required at both sites). Notwithstanding this, Option 1B would allow faster dismantling of submarines, which could generate financial savings by reducing costs associated with current afloat storage. By contrast, dual site activity would mean that this disturbance would be duplicated at both sites.

There may also be potential for effects in the long term, depending on how the storage of radioactive waste at the Devonport and Rosyth dockyards is perceived. On the one hand, as the facility is to be located within an existing nuclear licensed site this may be viewed as a continuation of existing use. On the other hand, some may perceive this as adding to licensed activities already taking place within a locality further undermining the attractiveness of the area to both current and prospective residents and businesses.

Health and Wellbeing; Noise and Vibration

As with any industrial activities, the SDP may have minor negative effects on local communities as a result of noise, vibration and emissions of dust and pollutants arising from the range of construction and operational activities. This will predominantly affect areas immediately around the dockyards and alongside local transport networks.

There would be no discernable effect on the public from any radiological discharges from either *planned* dismantling activities, or from an *unplanned* event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. It is, however, noted that the public may be anxious about new radiological activities or materials in their community, which could in itself have a slight detrimental effect on health for some people.

Workers directly involved in separating and eventually dismantling the RC would be exposed to additional radiation dose. This option avoids cutting into the RC until after interim storage, so occupational exposure would be the lowest of the three technical options. Maintenance and inspection of the RC during the interim storage period is considered to carry minimal risk of additional dose, as the radioactive material would be contained within the RC. Subsequent dismantling would occur after short lived isotopes (such as Cobalt 60) would have largely decayed, although doses from longer-lived isotopes such as Nickel 63 and Iron 55 would remain relatively unchanged. Worker dose exposure estimates for the RC option are expected to be between 0.07mSv and 0.11mSv per year (depending on the number of workers employed). These estimates are 0.35% and 0.55% of the total annual worker dose limits of 20mSv. These are the lowest dose estimates of the three technical options.

There is also very little dose associated with subsequent size reduction, since these would be carried out within a shielded and contained environment (a 'hot cell'). Provided the regulatory requirements for passive safety have been met, there would also be minimal risk during transportation.

Of the site options, there is considered to be a slightly greater potential for SDP activities to affect the health and well-being of the local population in Devonport (Option 1D) than in Rosyth (Option 1R). This is due to the much closer proximity of the dockyard to the densely populated and growing residential area of Devonport. The effects of disturbance are already mitigated to an extent by the fact that SDP activities would take place within the nuclear licensed areas, well away from the boundaries of the sites. There is not considered to be any difference in the radiological risk between the different siting options.

Geology and Soils

Undertaking SDP activities at Devonport and Rosyth dockyards is unlikely to have a significant impact on soil resource and function, as they are already heavily developed (although there may be some localised ground disturbance and a risk of mobilising existing contaminants at both dockyards if any intrusive ground works are needed). The potential risk is slightly heightened for the RC option when compared to the other technical options, given the much bigger interim storage facility required.

Water

Water would be required throughout the SDP, particularly during dismantling and segregation of the RC, for activities such as washing, cutting dust suppression, damping down and decontamination of removed components. SDP activities would also result in discharges, including surface run-off and effluent arising from water use on site. It is assumed that all discharges would be either to a sewer, or where required, via an effluent treatment plant so that there would be no planned discharges of water to an open water body. The risk of any accidental discharge of aqueous effluent into the environment is therefore considered to be very low.

The increased scale of the development of the interim storage facility (relative to the two other technical options) may result in greater levels of ground disturbance and hence increase the risk of existing contamination reaching groundwater or the adjacent estuarine waters. However, construction of SDP facilities would be phased, and separating activities into two phases could help lessen any effects on water resources. Option 1B is considered to have a greater potential to impact on water, as facilities would need to be provided at both dockyards, as would activities discharging water (although it is acknowledged that a dual site option will lessen individual site impacts on water quality).

If the chosen method of transport for the RC and/ or the fore and aft sections of the processed submarine were heavy lift boat or barge, capital dredging in the Plymouth Sound could be required (as previously discussed). Such dredging could mobilise contaminated sediment on the estuary bed (e.g. PAHs, which are known to be major contaminants of the lower part of the Tamar estuary) which could affect water quality in the wider Sound.

Air

Modifications to existing facilities, the construction of new facilities, and separating/ eventually dismantling the 700 – 1000 tonne RC would generate some fugitive emissions of dusts and gasses to air from earthworks, construction activities, cutting and transport. However, the possible increase is not anticipated to be significant at either site. Adoption of pollution control management procedures would help mitigate any potential nuisance from SDP activities on site.

Separating the RC from the submarine is not anticipated to lead to permitted levels of radioactive or hazardous discharges to air being exceeded at either Devonport or Rosyth dockyard. The work carries a remote risk of radioactive or hazardous contaminants being accidentally discharged to air. However, all risks will have to be minimised to 'ALARP' and be inherently safe to the satisfaction of the Regulators before any work could begin. Subsequent segregation and size reduction of the RPV would take place within a shielded facility, with full environmental containment where the potential for any unplanned emissions would be minimal.

Climate Change and Energy Use

Estimated energy use associated with SDP activities is not available; however there is not anticipated to be a substantial increase in energy use or greenhouse gas emissions when compared to current levels at Devonport and Rosyth dockyards; emissions are not anticipated to exceed current permitted levels under either the EU Emissions Trading Scheme or the Climate Change Agreement for the sites.

Coastal Change and Flood Risk

Due to existing drainage patterns and presence of impermeable surfaces, the proposed facilities are unlikely to affect existing flood risks. However, given their coastal locations, both Devonport and Rosyth dockyards are potentially vulnerable to storm / tide-related flooding. The majority of the Rosyth dockyard lies within a flood plain and has a 1 in 200 yr (0.5% annual probability) of flooding. By contrast, the southern fringe of the Devonport dockyard (around Tamar Wharf) and the wharfs fronting Basin No 5 lies within a floodplain with a higher flood risk of 1 in 75yr (1.3% annual probability). Sea levels are forecast to rise in the longer term, along with an increased risk of flooding, due to the effects of climate change for both locations. Given that the majority of the Rosyth dockyard lies within the floodplain, the risk will be higher at Rosyth when compared to Devonport.

However, both sites have existing sea defences in place to ensure that their current and anticipated activities can be carried out safely, with the risk of disruptive flooding reduced to 'ALARP' as part of the Licence conditions. Adequate defences will have to be maintained to mitigate the risk from all but exceptional flooding to undertake SDP activities.

Transport

The significance of transport effects will depend on the modes of transport used, the location of staff and materials, the level of traffic generated by development, operation and decommissioning, and the exact route(s) used.

SDP activities are not anticipated to result in any significant impacts on transport. However, a small negative effect is anticipated from development of the initial dismantling facility and the 11,600m^2 interim RC storage facility. This will involve the delivery of building materials and possibly the removal of footings, etc. However, construction of SDP facilities would be split into two phases, which would spread traffic movements and so reduce effects on local road networks.

The operational phase will create wastes and recyclates which will need to be removed from site. The RC option has the smallest effect of the three technical options, since the RCs will either be stored on site or, (in the case of the dual site option), moved away by sea. The residual hull pieces would also be taken by sea to the ship recycling facility. When the RCs are eventually dismantled, the estimated volume of ILW to be transported by road or rail to the proposed GDF is between 4 and 8 boxes per submarine, resulting in up to 8 trips per year (no more than 216 boxes in total, over the life of the project).

Of the siting options, the small effects on the local road network at Devonport dockyard could be slightly more pronounced, as Devonport is already heavily built up. However, routing vehicles via the Devonport link road from the A38 (rather than via local roads) will minimise the impact. By contrast, Rosyth dockyard is situated in a less populated area, on the fringe of the town of Rosyth and within easy access of several major routes, including the M90. Again, traffic to and from Rosyth dockyard can be routed to avoid residential areas.

In the case of Option 1D, the 7 submarines stored afloat at Rosyth dockyard would need to be moved to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 1R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be de-fuelled at Devonport dockyard, would need to be transported to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts associated with submarine transportation would therefore be greater for Option 1R.

Waste Management

Dismantling the submarines will generate a range of non-hazardous, hazardous and radioactive wastes where none existed before. Hence, it is considered that all options would have a negative effect on the waste objective. However, It is anticipated that many of the materials arising can be reused or recycled, largely mitigating this from a significant to a minor effect. For each submarine it is estimated that there will be between 4,000 and 7,000 tonnes of recyclable materials, depending on the class of submarine. Recyclates include high-grade steels, copper; lead ballast and precious metals as well as valuable components such as pumps and gauges. In addition, the SDP, as a responsible waste management project, is addressing the legacy of nuclear-powered submarines – hence the contrasting, positive effect of all options on the waste objective.

Since the submarines are overhauled during service and are largely cleared before being laid up, generally only residual amounts of hazardous material will remain in the submarines when they are dismantled. These include residual mineral oils, hydraulic fluids and refrigerant gases; asbestos in gaskets and inaccessible lagging; chromate paints and trace amounts of PCBs in switchgear and cabling. Potassium chromate liquid does, however, remain in the Primary Shield Tank.

With RC separation, little or no radioactive waste would arise at the initial dismantling stage as any LLW and ILW would be contained within the RC. Although ILW and LLW activity would reduce during interim storage, this would not result in significant reclassification of waste (or hence a reduction in waste volumes), due to the presence of long-lived isotopes. There is the potential that recycling technologies may have progressed in that time to increase the proportion of materials that could be decontaminated and hence recycled, although this is a point of conjecture.

Since RC separation will require the biggest interim storage facility, this option is likely to produce more demolition waste than the other options once the facility is decommissioned. Designing for recyclability from the start will help minimise the waste impacts from the facilities.

Land Use and Materials

Devonport and Rosyth dockyards are well established dockyards, with existing facilities and infrastructure in place that are broadly compatible with SDP facility requirements, although some modification to existing facilities and new build would be required - especially for the RC storage facility, which has a development footprint of 11,600 m^2 and would be likely to need a new building to house the RCs. Where possible, existing facilities and infrastructure would be used at both dockyards which would contribute positively towards sustainable land use. It is assumed that where practicable, sustainable design and construction techniques would be used in developing the facilities.

There is a slight possibility that SDP activities at either site could affect neighbouring land uses, depending on how the storage of radioactive waste at the dockyard is perceived. More information on this can be found in the cumulative effects assessment in **Section 6.8**.

Cultural Heritage

Given the built-up nature of the dockyards, the potential for affecting unknown archaeology is relatively minor, although any groundwork would always have the potential to remove previous dockyard features and structures which may be of interest. However, it is assumed that the listed buildings and scheduled monuments within the dockyards would not be damaged, given the protection afforded to them. There is a small risk of effects on protected features from development and operations (e.g. from vibration and traffic/ equipment emissions).

Of the siting options, taking account of the number and location of heritage assets there is considered to be a greater potential for minor impact on heritage assets at Devonport than Rosyth, due to the higher concentration of heritage assets both within Devonport dockyard and the wider environment.

6.3.3 Conclusions

With the exception of the effects that additional dredging (if needed) would have on Plymouth Sound and Estuary SAC and the potential visual impacts of the RC storage facility at either site, the potential effects of the RC option are generally anticipated to be minor (although the size of the interim storage facility means that those effects are marginally greater than for the other two technical options).

The principal benefit of the RC option is that it maximises the amount of in-situ radioactive decay, resulting in the lowest potential occupational dose to workers of the three technical options. That size reduction and segregation of the RC begins after approximately 25 years in interim storage may provide sufficient time to enable new dismantling techniques to be developed and applied (in accordance with the application of Best Available Technique principles, which should ensure that future operational discharges of radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain.

Of the siting options, Option 1D has the most potentially adverse environmental effects. This reflects the scale of the development required and the sensitivity of the surrounding environment (e.g. number of listed buildings in Devonport dockyard, proximity to densely populated residential areas, likely population growth). It also reflects the possibility that additional dredging might be needed to accommodate heavy lift vessels for moving the fore and aft sections of the submarine. This would have a significant adverse effect on the marine environment and ecosystems due to the physical displacement of the bed of the estuary within the SAC.

If the use of heavy lift ships and/or additional dredging within Plymouth Sound can be avoided, the effects on the Plymouth Sound and Estuaries SAC would also be avoided. This in turn would render Option 1B marginally worst performing option, due to the requirement to construct SDP initial dismantling facilities at both dockyards.

6.4 The Environmental Effects of SEA Integrated Option 2: RPV Removal with Interim Storage at the Point of Waste Generation

Option 2 involves removing the RPVs intact from the submarines and storing them on site. Following interim storage, the RPV would eventually be size reduced to Packaged Waste. This would then be transported to the proposed GDF. In the case of 2D, the submarines at Rosyth would be moved by sea to Devonport prior to initial dismantling. For 2R, all the submarines would be gathered at Rosyth for initial dismantling. For Option 2B, the submarines would undergo initial dismantling ‘in situ’ and the RPVs would be stored at one of the sites. This would necessarily involve the some of the RPVs being transported by road, rail or sea from Devonport to Rosyth, or vice-versa.

A summary of the assessment for Option 2 is shown in **Table 6.6** with commentary provided in the following sections. A full assessment is provided in **Appendix A.**

Table 6.6 Summary of the Environmental Effects of SEA Integrated Option 2

SEA Option Name	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
2D	-	-/+	0/-	-	-/?	-	-	-/?	0/-	-	-/+	-/+	0/-	0/-
2R	0/-	-/+	0/-	-	-/?	-	-	-/?	-	-	-/+	-/+	0	0/-
2B	-	-/+	0/-	-	-/?	-	-	-/?	0/-	0/-	-/+	-/+	0/-	0/-

Score Key:	+ + **Significant** Positive effect		+ **Minor** positive effect		0 No overall effect		- **Minor** negative effect		- - **Significant** negative effect	? Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

6.4.1 Likely Significant Effects of Option 2: RPV Removal with Interim Storage at Point of Waste Generation

There are no likely significant effects (either positive or negative) identified for this option.

6.4.2 Other (Minor) Potential Effects of Option 2

The potential effects associated with this Option are similar to those identified for Option 1 (RC separation). However, there are differences, reflecting the following factors:

- The way in which both the RPVs and the residual submarines can be transported after initial dismantling. The RPV Option does not need to consider the use of heavy lift vessels, since the 50-80 tonne RPVs can be transported by road and potentially rail, whilst the submarine hulls can be re-sealed and towed to the ship recycling facility.

- The number of jobs supported. This option would support 60-105 FTE jobs for the duration of SDP operations. Estimates of the number of jobs created from construction and decommissioning have not been available.

- When works are undertaken, particularly the phasing of construction and the removal of the RPV. Earlier incursion into the RC to remove the RPV will reduce the time available for radioactive decay, slightly increasing the estimated annual average worker dose (within existing statutory limits).

- The size of the facilities required. The estimated footprint of the interim storage facility for RPV is 801m^2 which is the smallest of the three technical options, and is over 14 times smaller than the footprint of the RC facility.

The consequences of this on the environmental objectives are discussed briefly below. *The narrative focuses on those areas where there are obvious differences to RC storage, so it does not repeat detailed discussions on effects where they are similar to that for SEA Option 1.*

Biodiversity and Nature Conservation

Following the removal of the RPV, the watertight integrity of the submarine hull will be restored, allowing the processed submarines to be towed to the ship recycling facility. No dredging would be required to facilitate submarine movement and so the associated effects would be avoided. There remains the potential for SDP activities at both Devonport and Rosyth to directly or indirectly impact on the marine environment, including internationally and nationally designated conservation sites as a result of accidental releases of pollutants during construction and operation.

Population

Estimates of the number of jobs associated with construction and eventual decommissioning have not been available. Excluding the construction and demolition of the SDP facilities, this proposed option would maintain 60-105 FTE jobs for the duration of the SDP. Similar to the RC option, there is a risk that suitably qualified and experienced workers would no longer be available to undertake the final size reduction of the RPV, given the potential 30-50 year gap between the two. The longer dismantling activities are delayed, the greater the risk that knowledge of existing processes and the industrial skill set will be lost.

As for RC separation, the RPV removal option is likely to increase the level of disturbance felt by the community close to the dockyards and transport routes slightly, as facilities are built and operated. Like the RC storage option, construction of the initial dismantling and interim storage facilities would be phased, with the technical size reduction facility not being needed until after interim storage. This would spread the effects of construction out over time and hence reduce their intensity. However, the scale of development would be over fourteen times smaller for RPV storage than it would be for RC storage, which will reduce construction-related effects considerably.

There may also be potential for effects in the long term on inward investment, depending on how the storage of radioactive waste at the Devonport and Rosyth dockyards is perceived.

Health and Wellbeing; Noise and Vibration

The removal of the RPV from the RC prior to interim storage would increase the potential occupational radiation dose to SDP workers slightly, when compared to the RC storage option. However, Statutory ALARP principles would be applied to minimise dose to well within statutory limits. Worker dose exposure estimates for the RPV option are estimated to be between 0.45mSv and 0.78mSv per year (depending on the number of workers employed). These estimates are 2.25% and 3.9% of the total annual worker dose limits of 20mSv. The risk of unplanned radiological exposure is also considered to be low.

Subsequent segregation and size reduction operations would carry very little dose, since ALARP principles would necessitate the use of radiologically shielded ‘hot cells’ when the metal of the RPV is being cut apart. The maintenance and inspection of the RPV during the interim storage period is considered to carry minimal risk, as the radioactive waste would be contained within the packaged RPV. Provided the Statutory passive safety requirements are met, there would also be minimal risk during transportation.

There would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event. However, as for the RC option, public anxiety may remain despite this very low level of risk, which could in itself have a slight detrimental effect on health for some people.

Transport

It is assumed that the RPV option would generate the lowest number of transport movements during construction, as the interim storage facility, at 801 m^2, would be the smallest of the three technical options. The phasing of construction would spread traffic movements over two periods, further reducing any potential impacts on the local road network.

Storing the ILW at the point of waste generation will reduce the number of off-site vehicle movements, as the RPVs would not need to be taken to a remote interim storage site, or (potentially) need to be brought back to the initial dismantling facility for size reduction and packaging. The only transport required for the ILW would be the single movement to the proposed GDF.

Landscape and Townscape

The RPV storage facility would be over 14 times smaller than the RC storage facility. This would effectively minimise any potentially significant visual impact of storage, within the already industrial context of the dockyards.

Geology and Soils, Water, Air, Climate Change and Energy Use, Coastal Change and Flood Risk, Waste Management, Land Use and Materials and Cultural Heritage.

The initial dismantling and size reduction facilities are assumed to be broadly similar across all technical options; however, the RPV option requires a new interim storage facility with an estimated footprint of $801m^2$, which is the smallest of three technical options. The consequential effects from construction (land take, construction materials used, transport movements, likely emissions to air and discharges to water or land), time required, disruption and nuisance experienced and waste generated will be much smaller than the RC storage option.

The infrastructure required by the RPV option would include a heavy lift crane. However, such infrastructure would be viewed as being in keeping with the existing dockyards facilities and activities and so would not constitute a significant negative effect on landscape character and setting.

6.4.3 Conclusions

No significant environmental effects were identified for removing the RPVs and storing them at the point of waste generation.

The potential construction effects of the RPV storage option would be considerably reduced relative to the RC storage option, due to the relatively small footprint of the interim storage facility. Construction would also be phased, which would help to keep levels of disturbance and emissions below levels at which they could significantly affect environmental receptors such as local populations, wildlife and heritage features.

The removal of the RPV from the RC would be undertaken early in the SDP process and as such, estimated worker radiological doses (and the risk of an unplanned radiological release) are projected to be slightly higher than the RC option. However, the RPV would not be size reduced until after interim storage, allowing for maximum in-situ radioactive decay to take place. The delay may also provide sufficient time to enable new dismantling and size reduction techniques to be developed and applied, in accordance with BAT principles.

Co-locating the interim storage facility with the initial dismantling facility again reduces the number of ILW movements off site.

Little significant difference was found between the site options in the assessment. Overall, the increased sensitivity of the environment at Devonport (e.g. number of listed buildings in Devonport dockyard, proximity to densely populated residential areas, likely population growth) will again cause the effects for options 2D and 2B to be slightly greater than those for 2R. However, the much reduced interim storage footprint has largely acted to minimise the environmental effects across all of the sites.

6.5 The Environmental Effects of SEA Integrated Option 3/4: RPV Removal with Interim Storage at a 'Remote' Site

Option 3/4 involves removing the RPVs intact from the submarines and storing them at a UK site which is 'remote' from the dockyards. The only difference between Options 2 and 3/4 is that an additional movement will take place off-site to interim storage, and (potentially) back again for size reduction and packaging once the proposed GDF becomes available to the SDP.

A summary of the assessment of Option 3/4 is shown in **Table 6.7** with commentary provided in the following sections. A full assessment is provided in **Appendix A.**

Table 6.7 Summary of the Environmental Effects of SEA Integrated Option 3/4

SEA Option Name	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: M Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
3/4D	-/?	-/+ /?	-/0 /?	-/?	-/?	-/?	-/?	-/?	-/?	-/?	-/+ /?	-/+ /?	-/?	-/?
3/4R	-/?	-/+ /?	-/0 /?	-/?	-/?	-/?	-/?	-/?	-/?	-/?	-/+ /?	-/+ /?	-/?	-/?
3/4B	-/?	-/+ /?	-/0 /?	-/?	-/?	-/?	-/?	-/?	-/?	-/?	-/+ /?	-/+ /?	-/?	-/?

Score Key:	+ + Significant Positive effect	+ Minor positive effect	0 No overall effect	- Minor negative effect	- - Significant negative effect	? Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

6.5.1 Likely Significant Effects of Option 3/4: RPV Removal with Storage at a 'Remote' Site

There are no likely significant effects (either positive or negative) identified for Option 3/4.

6.5.2 Other (Minor) Potential Effects of Option 3/4

The potential effects associated with this option are very similar to those identified for Option 2. However, there are a clear differences arising between locating the ILW interim storage facility on a remote site and at the location where the initial dismantling takes place. These are that:-

- The scale of the effects from siting facilities at two locations rather than one will be smaller; however, the combined total effects (such as on resource use, energy use, transport movements) will be greater.
- As the extracted RPVs would be transported off site for interim storage, this option would require more transport movements (with their associated environmental effects) than would storage at the point of waste generation. Depending on the location of the 'remote' site and

the type of transport used, this may have some very slight, localised impacts. However, the number of RPVs to be transported (27) is expected to be too small to have any discernable effect over the life of the project.

- Since the interim RPV storage facility could be on an inland site, the flood risks are potentially much smaller.
- The potential effects associated with the interim storage facility cannot be assessed in any meaningful way at this stage, as the location is not yet known. The potential for environmental effects would depend on (amongst others):
  - the location and characteristics of the remote site;
  - the existing use of the site;
  - the range and scale of other nuclear related activities on the Licensed/Authorised remote site;
  - its proximity to designated/ protected wildlife or heritage sites;
  - the local environmental quality (air and water quality, landscape quality);
  - its proximity to local populations and the characteristics of those populations;
  - the local economy and employment market;
  - people's familiarity and experience of Licensed/Authorised activities.

It cannot therefore be concluded whether this option will perform better or worse than the other options (except in general terms for transportation), until the candidate sites for interim storage are identified and further assessment is undertaken.

6.5.3 Conclusions

No significant environmental effects are identified for Option 3/4.

Locating the initial dismantling facility at either Devonport or Rosyth (or both) will have the same type of more minor environmental effects as Option 2. The difference is the additional local disturbance, increased transport and subsequent slight air quality effects associated with developing the remote storage facility and moving the ILW to it. The effects would be more easily accommodated when spread over two sites; however, the likely duplication of activities means that the absolute emissions and resources used will be greater in a dual site option than they would be in a single site option.

As a 'remote' ILW storage site has not been identified at this stage, the potential effects of interim storage and segregation activities on the environment and local populations are uncertain. The conclusions reached regarding which of the options could have the greatest effect have therefore in the most part been informed by the anticipated site-specific impacts of SDP activities at the Devonport and Rosyth dockyards. **It should be noted that the identification of a remote site for interim storage is likely to affect the final outcome of the assessment.** Further assessment may therefore be required, depending on which options are taken forward**.**

6.6 The Environmental Effects of SEA Integrated Option 5: RPV Removal and Size Reduction to form Packaged Waste, with Interim Storage at the Point of Waste Generation

Option 5 involves removing the RPVs intact from the submarines, then size reducing them into smaller pieces and placing them into approved, $3m^3$ storage containers, before storing them on site. In the case of 5D, the submarines at Rosyth would be moved by sea to Devonport prior to initial dismantling. For 5R, all the submarines would be gathered at Rosyth for initial dismantling. For Option 5B, the submarines would undergo initial dismantling ‘in situ’ and the Packaged Waste would be stored at one of the sites. This would necessarily involve the some of the $3m^3$ storage containers being transported by road, rail or sea from Devonport to Rosyth, or vice-versa.

A summary of the assessment of Option 5 is shown in **Table 6.8** with commentary provided in the following sections. A full assessment is provided in **Appendix A.**

Table 6.8 Summary of the environmental effects of SEA Integrated Option 5

SEA Option Name	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
5D	-	-/+	-/0	-	-/?	-	-	-/?	-/0	-	-/+	-/+	-/0	-/0
5R	-/0	-/+	-/0	-	-/?	-	-	-/?	-	-	-/+	-/+	0	-/0
5B	-	-/+	-/0	-	-/?	-	-	-/?	-/0	-/0	-/+	-/+	-/0	-/0

Score Key:	+ + **Significant** Positive effect		+ **Minor** positive effect		0 No overall effect		- **Minor** negative effect		- - **Significant** negative effect	? Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

6.6.1 Likely Significant Effects of Option 5: Removal and Size Reduction to Packaged Waste, with Storage at the Point of Waste Generation

There are no likely significant effects (either positive or negative) identified for Option 5.

6.6.2 Other (Minor) Potential Effects of Option 5

The potential effects associated with this Option are similar to Option 2 (RPV removal and storage the point of waste generation). However, there are some differences:

- The number of movements and mode of transport used. GDF-compliant, $3m^3$ packages are transportable by road, rail or sea.
- The Packaged Waste option will involve the immediate removal of radioactive materials and size reduction of the RPV; the extent of the specialist facilities needed to do this safely will reflect the fact that in-situ radioactive decay will not have occurred to the same extent as for the RC or RPV storage options.
- All facilities will need to be completed before RPV size reduction begins, and construction phasing is less likely than for the RC and RPV options.
- The estimated footprint of the interim storage facility for Packaged Waste is $1,005m^2$, which is marginally larger than the $801m^2$ RPV option, but around eleven times smaller than the RC storage footprint.

The consequences of this are discussed briefly below.

Biodiversity

For the Packaged Waste option, the submarine hull integrity can be restored following the removal of the RPV, to enable the processed submarines to be towed to a ship recycling facility. No dredging would be required to facilitate submarine movement and so associated effects on biodiversity would be avoided.

Population

Estimates of the number of jobs associated with construction and eventual decommissioning have not been available. However, this option would maintain 60-105 FTE jobs for the duration of SDP operations. A significant proportion of these are expected to be highly skilled, specialist nuclear jobs. This would bring some economic benefit into the local area through jobs supported, inward investment and through local supply chains. As full dismantling would take place straight away, the Packaged Waste option would enable full advantage to be taken of existing skilled personnel, particularly those with practical knowledge gained from operating and conducting engineering work on the submarines. As a result, the risk of losing suitably qualified and experienced workers would effectively be avoided.

Of the siting options, Option 5B would again have a more positive effect than Options 5D and 5R, as undertaking SDP activity on both dockyards would benefit two local economies (although this is unlikely to be the most economically efficient solution overall, as economies of scale would not be realised). Notwithstanding this, Option 5B would allow faster dismantling of submarines, which could generate financial savings by reducing costs associated with current afloat storage.

As with all options, there would be localised community disturbance experienced arising from construction activities and associated traffic movements, including noise, vibration and emissions to air and water. In the long term, there could be potential minor effects on the attractiveness of the area to both current and prospective residents and businesses, depending on how the processing and storage of radioactive waste is perceived.

Health and Wellbeing

As for all options, removing the RPV from the RC would be the most dose intensive activity, with lower doses associated with subsequent dismantling operations (which would have to be conducted in shielded facilities).

Estimated radiological doses for workers would be the highest of the three technical options, as the in-situ decay of short lived isotopes will not have occurred to the same extent as for the RC or RPV storage options before the RPV is size reduced. Dose estimates are to be between 0.48mSv and 0.83mSv per year (depending on the number of workers employed). These estimates are 2.4% and 4.15% of the total annual worker dose limit of 20mSv. For similar reasons, the Packaged Waste option also carries a slightly higher inherent risk to workers from inadvertent radiological exposure, due to the early segregation and size reduction of the RPV. Neverthless, the risk of unplanned radiological exposure is considered to be low because of the statutory safety requirements that are in place.

The maintenance and inspection of the Packaged ILW during the interim storage period is considered to entail minimal occupational dose, as the ILW would be packaged within approved long-term interim storage containers, minimising the need for maintenance and inspection. Provided the passive safety and regulatory requirements have been met, there would also be minimal risk during transportation.

As a result, neither the public nor the wider environment is likely to be affected by planned activities. Given the overwhelmingly solid nature of the ILW, any unplanned (accidental) releases are also unlikely to affect either people or the environment. However, as for the RC and RPV options, public anxiety may remain despite this very low level of risk, which could in itself have a slight detrimental effect on health for some people.

Transport

Of the technical options, the scale of development required for the Packaged Waste storage option (with a footprint of 1,005m^2) would be very similar to the RPV options, but much smaller than the RC option. Unlike for the other options which phase construction, all of the initial dismantling, storage and size reduction facilities would need to be constructed prior to removal of the RPV. This could bring a slight and short term increase in construction traffic, with the potential to impact on local road networks.

Geology and Soils, Water, Air, Climate Change and Energy Use, Coastal Change and Flood Risk, Waste Management, Land Use and Materials, Cultural Heritage and Landscape and Townscape

The initial dismantling and size reduction facilities are assumed to be broadly similar across all technical options; however, the Packaged Waste option requires a new interim storage facility with an estimated footprint of 1005m^2, which is slightly larger than for the RPV options but still less than 10% of that proposed for the interim storage facility for the RC. The consequential effects from construction on sensitive receptors (land take, construction materials used, transport movements, likely emissions to air and discharges to water or land, time required, disruption and nuisance experienced and wastes generated impacts) will be similar to but slightly higher than for the RPV storage (Options 2 and 3/4).

As for the RPV, the infrastructure required by the Packaged Waste option would include a heavy lift crane to remove the RPV from the submarine. However, such infrastructure would be viewed as being in keeping with the existing dockyards facilities and activities and so would not constitute a significant negative effect on landscape character and setting.

6.6.3 Conclusions

No significant environmental effects were identified for removing the RPVs and size reducing them to fully-packaged waste.

The potential construction effects of the Packaged Waste storage option would be considerably reduced relative to the RC storage option, due to the relatively small footprint of the interim storage facility.

However, as all facilities would be required 'up front,' construction-related effects at the dockyard(s) in the first instance would be slightly greater than they would be for the RPV storage option, where construction of the size reduction and packaging facilities might not be undertaken for several decades.

The Packaged Waste option does entail the highest potential radiological doses to workers of the three technical options due to the early incursion into the RPV, albeit that doses will remain well within safety limits and will have to be 'ALARP' for work to take place. As a consequence of when this activity would occur, this option is also considered to carry a slightly higher risk of unplanned (accidental) dose to workers, albeit that this is still very low. Current discharge levels are a tiny fraction of the current Statutory permitted levels from the dockyards, and it is not expected that any increase in these permitted levels will be required.

Co-locating the interim ILW storage facility with the initial dismantling facility again reduces the number of ILW movements off site before final movement of the ILW to the proposed GDF.

Little difference was found between the site options in the assessment; the Devonport option (5D) was found to have a marginally greater effect on biodiversity and cultural heritage, but have less effect on flooding and coastal change. Option 5B would result in additional transport movements from transporting the RPVs from one dockyard to another for dismantling to Packaged Waste.

6.7 The Environmental Effects of Integrated SEA Option 6/8: RPV Removal and Size Reduction to form Packaged Waste, with Interim Storage at a 'Remote' Site

Option 6/8 is very similar to Option 5, but involves storing the 3m^3 containers either at a MOD, Commercial; or NDA site elsewhere in the UK, rather than at the point of waste generation. In the case of 6/8D, the submarines at Rosyth would be moved by sea to Devonport prior to initial dismantling. For 6/8R, all the submarines would be collected at Rosyth for initial dismantling. For Option 6/8B, the submarines would undergo initial dismantling 'in situ.' In all cases, the ILW would be removed off site by road, rail or sea.

A summary of the assessment for Option 6/8 is shown in **Table 6.9** with commentary provided in the following sections. A full assessment is provided in **Appendix A.**

Table 6.9 Summary of the Environmental Effects of SEA Integrated Option 6/8

SEA Option Name	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
6/8D	-/?	-/+ /?	-/0 /?	-/?	-/?	-/?	-/?	-/?	-/0 /?	-/?	-/+ /?	-/+ /?	-/0 /?	-/0 /?
6/8R	-/0 /?	-/+ /?	-/0 /?	-/?	-/?	-/?	-/?	-/?	-/0 /?	-/?	-/+ /?	-/+ /?	0/?	-/0 /?
6/8B	-/?	-/+ /?	-/0 /?	-/?	-/?	-/?	-/?	-/?	-/0 /?	-/0 /?	-/+ /?	-/+ /?	-/0 /?	-/0 /?

Score Key:	+ + **Significant** Positive effect		+ **Minor** positive effect		0 No overall effect		- **Minor** negative effect		- - **Significant** negative effect	? Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

6.7.1 Likely Significant Effects of Option 6/8: RPV Removal and Size Reduction to Form Packaged Waste, with Interim Storage at a 'Remote' Site

There are no likely significant effects (either positive or negative) identified for Option 6/8.

6.7.2 Other (Minor) Potential Effects of Option 6/8

The potential effects associated with this option are similar to those identified for Option 5. However, there are clear differences arising from locating the ILW interim storage facility on a site other than where the initial dismantling takes place. These are that:

- The scale of the effects from having facilities at two locations rather than one will be smaller; however, the combined total effects (such as on resource use, energy use, transport movements) will be greater.

- As the Packaged Waste would be transported to a remote site for interim storage, there will be a greater number of transport movements than would be the case for storing the ILW at the point of waste generation. Depending on the location of the remote site and the type of transport used, this may have some very slight, localised impacts. However, the number of $3m^3$ packages (assumed to be between 108 and 216 in total, with no more than two on the road at any one time) is expected to be too small to have any discernable effect over the life of the project. As the interim ILW storage facility could be on an inland site, the flood risk could be significantly reduced.

- The potential effects associated with the interim storage facility cannot be assessed in anything other than generic terms at this stage, as the location is unknown. As a consequence, it cannot be concluded whether this option will perform better or worse than Option 5, until the candidate sites for interim ILW storage are identified and further assessment is undertaken. As a result, the assessment matrix has concluded similar results to Option 5, with the slight differences attributable to the factors listed above.

6.7.3 Conclusions

No significant environmental effects have been identified for Option 6/8.

Locating the initial dismantling facility at either Devonport or Rosyth (or both) will have similar environmental effects as for Option 5 (although the scale and duration would be less). However, as this option proposes interim storage at a remote site, it would result in some additional local disturbance, transport and air quality effects at the storage site. The effects could be more easily accommodated when spread over two sites; however, in absolute terms (due to the likely duplication of activities) the absolute emissions and resources used will be greater than a single site option.

As a remote ILW storage site has not been identified at this stage, the potential effects of interim storage and segregation activities on the environment and local populations are uncertain. The conclusions reached regarding which of the options could have the greatest effect have therefore in the most part been informed by the anticipated site specific impacts of SDP activities at the Devonport and Rosyth dockyards. **It should be noted that the identification of a remote site for interim storage is likely to affect the final outcome of the assessment.**

6.8 Assessment of Cumulative Effects

6.8.1 The Cumulative Effects of the SDP Proposals

The SEA Regulations require that secondary, cumulative and synergistic effects of the SDP are assessed. Whilst relevant secondary and synergistic effects are included in the detailed assessment at Appendix A, the cumulative effects of the SDP proposals are summarised in the following section.

As applied to the proposals, cumulative effects comprise the following:

- the combined effects of activities arising from the development which could affect sensitive receptors or locations;

- the combined effects of the SDP proposals with effects from other proposed infrastructure projects or developments located in proximity to the SDP site(s), which may magnify the effects. An example would be the increase in localised effects on traffic, nuisance and air quality where two or more major projects are constructed at the same time.

The implications of the first aspect have been considered through the assessment of each option and reflected in the commentary in Sections 6.2 to 6.7.

In considering the implications of the second aspect, the potential for the SDP proposals to act cumulatively with other plans or proposed projects has been considered for both Devonport and Rosyth. These are presented in **Tables 6.10** and **6.11**, respectively. The plans or projects considered are those that are in the public domain and are either:

- an adopted organisational plan or programme; e.g. an Area Action Plan or Site Allocation document; or
- a proposal for development that is of sufficient scale to be subject to Environmental Impact Assessment as a part of the Planning process.

This is to ensure that there is sufficient maturity to the proposals to enable an adequate level of assessment to be completed, and to avoid unnecessary assessment for projects which are not funded or are merely aspirational.

6.8.2 Potential Effects of the SDP with other Plans or Proposals at Devonport

Three principal plans and proposals with the potential to act cumulatively with the SDP proposals at Devonport have been identified. These are as follows:

- Devonport landing craft co-location project;
- Devonport area action plan 2006-2021 adopted 2007;
- Energy from waste combined heat and power facility north yard, Devonport; and
- New development for princess yachts, south yard, Devonport.

Each plan/proposal is described in-turn below.

Devonport Landing Craft Co-location Project (DLCCP)

This proposal supports the co-location of the Royal Marines' specialist landing craft units in HM Naval Base Devonport, helping to realise long-term savings on operating and site maintenance costs for the Defence Estate. The Weston Mill Lake site on which the DLCCP is being developed is situated at the northern boundary of the base, immediately south of Barne Barton.

DLCCP comprises a small marina, offices and classrooms housed within a new building, a new rock revetment at Wilson's Beach, as well as a new slipway, finger jetty, boat yard and Engineering Facility at the western end of Weston Mill Lake. Capital dredging, and subsequent maintenance dredging, is required. Wilson's Beach at the western end of Weston Mill Lake will be used more frequently for training purposes. The construction of the marina requires the existing 13 Wharf Pontoon arrangement to be reconfigured and will incorporate the recently constructed 14 Wharf Small Boat Facility. The engineering facility and boat yard will be arranged around the existing helipad safety zones and vehicle parking. Construction was started summer 2011 with project completion expected by winter 2012/13.

Devonport Area Action Plan (AAP) 2006-2021- Adopted 2007

The Devonport AAP supports the regeneration of Devonport and identifies the proposals and policies that will guide development of the area through to 2021. The Plan sets out the following vision for the Devonport:

"To re-create Devonport as a distinct place in modern Plymouth, a vibrant self sustaining community; a place of real quality, variety and interest, the pride of residents, attractive to visitors and a model of 21st century living working and playing. This will be achieved by:

- developing a new centre for Devonport, based on Chapel Street and supported by the redevelopment of the surrounding areas;
- improving the range, quality, and choice of housing;
- providing local employment opportunities;
- providing for a better range of local services and facilities;
- improving connectivity throughout the community with pedestrian routes, cycle ways, and high quality public transport;
- protecting natural and historic assets; and
- requiring all new development to be of a high quality, safe and appropriate in the context of Devonport's heritage."

The AAP makes provision for 1,050 new dwellings, 11,000m^2 of employment floor space and 1,800m^2 of retail floor space to 2016 with sites including the former MOD South Yard Enclave and land at the former MOD Mount Wise to the east of Devonport Dockyard.

Energy from Waste Combined Heat and Power Facility North Yard, Devonport

MVV Environment Devonport Ltd submitted a planning application in May 2011 for development of an Energy from Waste (EfW) plant incorporating Combined Heat and Power (CHP), to be located at North Yard in the north east of HM Naval Base Devonport. An Environmental Permit application for the MVV EfW CHP has been prepared in parallel with this planning application and EIA and will be submitted shortly after the planning application.

The EfW CHP facility will be a large building, 45m high at the highest point and 134m long, with a width varying between 30 and 81m and an exhaust stack 95m high. The facility will treat waste from the southwest Devon area and has a 265,000 tonne capacity. Waste will be incinerated and the heat used to generate electricity for use at the facility, to supply Devonport Naval Base and for export to the National Grid. Steam will also be extracted and fed into the Naval Base steam network for heating purposes. Bottom ash will be transported off site and recycled; residues from the air pollution control system will require disposal off site at a licensed hazardous waste landfill. The design life of the EfW CHP facility will be 30 years, and the life expectancy of the facility is approximately 40 years.

New Development for Princess Yachts, South Yard, Devonport

Planning permission was granted in March 2011 for a new production facility, office building and test facility for Princess Yachts International Ltd, a manufacturer of luxury motor yachts. The proposed development comprises the following elements:

- production facility with a floor space of 15,434m^2 and height of 25m;
- two storey office building providing 3,710m^2 of office space;
- test facility covering an existing shallow dock of height approximately 15m; and
- a total of 421 car parking spaces and 93 cycle spaces.

The site is situated at the north eastern end of the South Yard in a previously active area of the Naval Dockyard and is located within the area covered by the Devonport AAP.

Table 6.10 Comparison of cumulative effects in published Plans or Project proposals at Devonport

SEA Objective	EfW CHP, North Yard	DLCCP	Devonport AAP	Princess Yachts, South Yard	Commentary
A. Biodiversity and Nature Conservation *Protect and enhance habitats, species and ecosystems.*	-	-/--	+/-	0/-	Dredging is required to maintain the DLCCP marina (in addition to the dockyard more generally) and could be required to accommodate heavy lift operations for the RC option. This could have a cumulative effect on the marine environment and ecosystems due to the physical displacement of the bed of the estuary within the Plymouth Sound and Estuaries SAC. This could impact on marine habitat and species and also indirectly affect bird populations. In addition, any disposal of dredged material at sea could also impact on marine habitats and species. There is potential for the SDP proposals and operation of proposed B2 uses which comprise the Devonport AAP (including within the South Yard Enclave), DLCCP boatyard and engineering facilities and the EfW CHP facility to have a slight adverse effect on biodiversity (e.g. due to the impacts of noise and vibration, emissions to air and lighting). However, all operational activities will be regulated and subject to environmental permitting requirements such that cumulative effects are not expected to be significant. The transport improvements proposed within the Devonport AAP (e.g. junction improvements and increased public transport provision) may help offset any cumulative negative effects from disturbance on biodiversity arising from transport (e.g. by reducing congestion). Potential for enhancement through use of planting and landscaping to meet additional AAP design requirements.
B. Population *Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts.*	+/-	+	++/-	+	It is envisaged that all proposals will generate employment opportunities and wider economic benefits. The Devonport AAP in particular makes provision for some 11,000m^2 of employment land to 2016 whilst development of the South Yard for Princess Yachts is expected to secure/provide 200 additional jobs and 90 apprenticeships. The phasing of proposals indicates that there will be some overlap between construction of the SDP and the development within the AAP and as such there will be a range of economic benefits are considered to be positive and significant. This will include the number of construction and permanent jobs and the local economic opportunities afforded to local suppliers. The proposals may also cumulatively support the viability of existing and proposed community services and facilities including, for example, leisure, recreation, education and housing as a result of an increase in the local resident and worker population. There is potential for the construction and operation of SDP

SEA Objective	EfW CHP, North Yard	DLCCP	Devonport AAP	Princess Yachts, South Yard	Commentary
					facilities in conjunction with the operation of the EfW CHP to cause some localised disturbance to communities due to dust and noise nuisance. Residential development is proposed within the Devonport AAP which is close proximity to the east of the dockyard. This includes, amongst other allocations, 460 dwellings at the South Yard Enclave, 25 dwellings at Marlborough Street Primary School and 40 dwellings at Mount Wise Primary School. There is also potential for the construction of SDP facilities to increase the disturbance felt by current and future residents in these locations (e.g. due to noise and vibration and emissions to air). However, effects from construction will be managed and mitigated through implementation of a CEMP and all operational activities will be regulated and subject to environmental permitting requirements. Devonport is already a well-established naval base which has been undertaking specialist radiological work on submarines (including refuelling/ defuelling) for many years. The combined activities could potentially act to reduce the attractiveness of the area to existing and prospective residents and business, which in turn could affect the realisation of the AAP regeneration proposals. However, this is dependent on how activities are ultimately perceived.
C. Health and Wellbeing *Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.*	**0**	**0/-**	**+/-**	**0**	There is potential for the construction and operation of SDP facilities and operation of proposed B2 uses which comprise the Devonport AAP (including within the South Yard Enclave), DLCCP boatyard and engineering facilities, the EfW CHP facility and the production/test facilities within the South Yard to cumulatively affect the health and wellbeing of residents in close proximity to the facilities and along transport routes. This will be due to the health impacts of noise and vibration and emissions to air from operations and associated HGV movements. It is also noted that residential and commercial development is proposed in close proximity to the dockyard which may increase the potential for disturbance. However, effects from construction will be mitigated through implementation of a CEMP and all operational activities (including those associated with the EfW CHP facility, DLCCP and any future industrial development) will be regulated and subject to environmental permitting requirements. The EfW proposals have raised a number of local community concerns regarding the potential adverse effects on health. These anxieties are likely to be accentuated when considered in conjunction with the SDP. In addition, the proximity of residential properties and businesses anticipated by the Devonport AAP may also exacerbate any local anxieties about undertaking radiological work. Cumulatively, the proposals may support the viability of existing health services and facilities including additional provision proposed within the Devonport AAP (e.g. a new GP Surgery at Brickfields).

SEA Objective	EfW CHP, North Yard	DLCCP	Devonport AAP	Princess Yachts, South Yard	Commentary
D. Noise and Vibration *Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration.*	-	-	-	-	Operating the EfW CHP facility is forecasted to generate 264 daily HGV movements in the vicinity of Camel's Head and Weston Mill Drive. Construction of the SDP facilities at Devonport will increase transport-related noise to an extent; however the operational phase will not generate significant additional traffic. Some cumulative negative effects may be generated from on-site noise, in conjunction with the other developments. This will be more of an issue during the development phase, especially for residential and commercial properties in close proximity to the dockyard. However, it is not expected that cumulative effects would be significant due to the need for each proposed development to adhere to the requirements of legislation (e.g. Environmental Protection Act 1990, Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites).
E. Geology and Soils *Minimise threats to the extent and quality of soils and geological resources.*	0	0	0	0	The proposals are unlikely to have an effect on soil resource and function, as the sites are already heavily developed. There is a minor and localised risk of mobilising existing contaminants during construction as the dockyard area consists of reclaimed or historically contaminated land. However, the likelihood of such effects occurring cumulatively is considered low due to development phasing, construction management and regulator requirements.
F. Water *Maximise water efficiency, protect and enhance water quality.*	-/0	-	-	-	Cumulatively, there is potential for the proposals to significantly increase water consumption, particularly in view of the scale of development proposed within the Devonport AAP area. This could affect water resource availability, especially during periods of low flow on the River Tavy (which has been by classified by the Environment Agency as over-abstracted at low flows). However, potential effects on water resources would be assessed in the determination of any new abstraction licenses by the EA. It is noted that this proposal will occur during a period of reduced dockyard activity under the Naval Base Review which may to a limited extent, offset some of the demand from the SDP. It is not expected that there would be any significant cumulative effects on water quality. This reflects the fact that all activities would be regulated and subject to environmental permitting requirements. However, there remains a risk of accidental discharge of pollutants and surface water run off containing oils and hydrocarbons which could impact on water quality. However, it is expected that, through appropriate mitigation, the likelihood of such risks occurring will be low. Any additional dredging required to maintain the DLCCP marina and to accommodate heavy lift operations at Devonport Dockyard (if required) could have a cumulative negative effect on water quality and the aquatic and estuarine environment. However, this is unlikely to be needed.

SEA Objective	EfW CHP, North Yard	DLCCP	Devonport AAP	Princess Yachts, South Yard	Commentary
G. Air *Minimise emissions of pollutant gases and particulates and enhance air quality*	-	-	-	-	Increased traffic movements from SDP may have a cumulative negative effect on air quality, particularly in the vicinity of Camel's Head and Weston Mill Drive due to the operation of the EfW CHP facility (which is forecasted to generate 264 daily HGV movements). Depending on routing, there is also potential for traffic from Devonport to pass through Plymouth City AQMAs. However, taking account of anticipated combined transport movements, these effects are not expected to be significant. Moreover, the transport improvements proposed within the Devonport AAP (e.g. junction improvements and increased public transport provision) may help offset any cumulative negative effects (e.g. by reducing congestion). Cumulative negative air quality effects may be generated from construction and operation of SDP facilities, when considered alongside the other developments. However, emissions from all sources would be managed through environmental permitting, so that any effects would not be significant. This is a particular issue for the EfW facility, where public anxiety about hazardous air emissions remains. There remains a risk of accidental discharge of contaminants to air which could impact on air quality. However, it is expected that, through appropriate mitigation, the likelihood of such risks occurring will be very low.
H. Climate Change and Energy Use *Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.*	+/-	-	-	-	Cumulatively, there is potential for the proposals to significantly increase energy consumption both through increased traffic movements and energy consumption once newly constructed commercial premises and residential dwellings are occupied. Increased energy use associated with the Devonport AAP proposals may be partially offset by the requirement within the AAP for new commercial development to meet BREEAM Excellent standards and aspiration for residential development to meet Code for Sustainable Homes' Level 5/6 whilst improvements to transport infrastructure and support of sustainable transport modes could reduce traffic emissions. The EfW CHP proposal would generate electricity for use at the facility, to supply Devonport Dockyard and Her Majesty's Naval Base (HMNB) and for export to the National Grid. Steam will also be fed into the Devonport Dockyard and Naval Base steam network for heating. It is also understood that the proposed new South Yard development for Princess Yachts is to incorporate on-site renewable energy generation to offset at least 15% of the development's carbon emissions.

SEA Objective	EfW CHP, North Yard	DLCCP	Devonport AAP	Princess Yachts, South Yard	Commentary
I. Coastal Change and Flood Risk *Minimise the risks from coastal change and flooding to people, property and communities.*	**0**	**-/?**	**0**	**0**	Developing SDP infrastructure is not expected to increase off-site flood risks, as the dockyards are already largely built up. There is potential that any increase in impermeable surfaces following development of the other proposals could result in an overall increase in flood risk, due to surface water runoff. However, it is assumed that Flood Risk Assessments will inform development proposals and that appropriate measures to alleviate flood risk (e.g. SUDS) would be incorporated such that there is not considered to be any significant cumulative effects on this aspect of the objective. Sea level rise as a result of climate change could also increase the risk of flooding which could affect proposals at or close to sea level, and increase flood defence costs Sea level, (corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900 mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Any additional dredging required to maintain the DLCCP marina could have a cumulative effect on estuary geomorphology if capital dredging is also required to accommodate heavy lift operations at Devonport Dockyard (e.g. alteration of sediment pathways and changes to siltation patterns) due to the removal of substantial volumes of seabed sediment. There could also be the potential for dredging to mobilise contaminated sediment on the estuary bed, although current levels of contamination are unknown This could have a consequential affect on neighbouring coastal areas through changes to coastal processes, and affect the resilience of neighbouring areas to flooding.
J. Transport *Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.*	**-**	**-**	**+/-**	**-**	As discussed above, all of the proposals will result in an increase in traffic movements in the Devonport area, so some cumulative effects are anticipated for congestion and accident risk These would be highest during the construction of SDP facilities given the associated HGV movements - particularly when taking into account the forecasted volume of HGV movements (approximately 264 per day) associated with operating the EfW CHP facility, the daily HGV movements (up to 20 per day) likely to be generated by the new South Yard development for Princess Yachts and the projected increase in population and economic activity under the Devonport AAP. Overall however, taking account of anticipated combined transport movements, the transport improvements proposed within the AAP and the use of traffic management plans to minimise disturbance, the cumulative effects, are not expected to be particularly significant, *unless* the RC storage option were taken forward and construction materials could not be delivered by sea.

SEA Objective	EfW CHP, North Yard	DLCCP	Devonport AAP	Princess Yachts, South Yard	Commentary
K. Waste Management *Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities.*	+/-	-	-	0/-	The SDP is not expected to significantly increase the amount of waste needing local treatment during operation, as virtually all of the recovered materials (whether hazardous or recyclable) will be sent away for further processing. Only process and personnel-related wastes will need management. There may, however, be some construction and eventually demolition-related wastes that will need to be processed – the amount will depend on the size of the facilities, with the RC storage option having the largest effect. Cumulatively, the proposals are expected to result in an increase in waste that will need to be managed locally, primarily from the new residential and commercial development proposed within the Devonport AAP. It is expected that an increasing proportion would be reused or recycled, in line with Plymouth's Municipal Waste Management Strategy. The proposed EfW CHP scheme at North Yard, which is designed to treat 245,000 tonnes of waste per year (comprising solid domestic, commercial and industrial waste), would serve to increase waste management capacity in the area and reduce the volume going to landfill considerably.
L. Land Use and Materials *Contribute to the sustainable use of land and natural and material assets.*	+/-	+/-	+/-	+/-	All sites identified for development are classified as previously developed land and as such, would be considered to beneficial reuse of a valuable resource. However, all projects would require the use of construction materials, to a varying amount and would need to consider the potential to use sustainable design and construction techniques to optimise resource use. Due to the redevelopment of some areas within Devonport, there may be potential to reuse demolition materials and aggregates generated in construction of some aspects of the infrastructure required (e.g. foundations).
M. Cultural Heritage *Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features.*	0/-	+	+	0/-	The SDP will continue and help safeguard a long tradition of maritime activity at the historic dockyard. This, in conjunction with both the DCCLP (which is focussing the Royal Marines' operations in Devonport) and the Devonport Area Action Plan (which aims to maintain the heritage of the area whilst diversifying the local economic base), could be perceived as having a small positive effect on the cultural heritage of the area. Increased traffic movements associated with the construction and operation of SDP facilities, HGV movements related to the operation of the EfW facility as well as any increase in traffic associated with the wider redevelopment of Devonport could have slight effect on cultural heritage assets due to pollution from engine exhausts and vibration associated with any increase in rail or road traffic).

SEA Objective	EfW CHP, North Yard	DLCCP	Devonport AAP	Princess Yachts, South Yard	Commentary
N. Landscape and Townscape *Protect and enhance landscape and townscape quality and visual amenity*	-	0	0	0	The EfW facility is a significant structure with a 45m stack. If the RC option of the SDP is taken forward that includes storage of the RCs at Devonport, it is likely that in conjunction they will represent a substantial and negative change to the landscape. Other SDP options represent less visually intrusive options, more in keeping with the prevailing dockside development. The employment and residential development anticipated in the Devonport AAP will alter the current character of local townscapes within Devonport; however, the AAP states that 'the physical fabric of the area will be improved as a result of new and re-development opportunities, as well as environmental improvements to existing buildings, streets and open spaces. Objective 7 of the AAP vision commits the Council to requiring all new development to be of a high quality, safe and appropriate in the context of Devonport's heritage. In consequence, it is not considered that there will be a significant cumulative effect on this objective.

Score Key:	+ + **Significant** Positive effect		+ **Minor** positive effect		0 No overall effect		- **Minor** negative effect		- - **Significant** negative effect	? Score uncertain
NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.										

6.8.3 Potential Effects of the SDP on Plans and Proposals for Rosyth

The principal plans and proposals that have been identified with the potential to act cumulatively with SDP proposals located in Rosyth are as follows:

- Rosyth Renewable Energy Plant;
- Rosyth International Container Terminal;
- Ferry Terminal Expansion; and
- Forth Crossing.

Each proposal is described in-turn below.

Rosyth Renewable Energy Plant

Forth Energy is seeking consent to construct and operate the Rosyth Renewable Energy Plant with a net electrical output of 100 Megawatt (MWe), which is expected to be exported to the local electricity network. If feasible (dependant on calorific value), renewable heat of up to 1 million tonnes of biomass fuel per year will also be exported to local users. The EIA considering these proposals was published in November 2010.

The area of the proposed site is 25.2 hectares; the onshore element of the site is wholly located within the operational boundary of the Port of Rosyth. The proposed site is considered to be suitable as it is adjacent to an operational quay capable of taking suitably sized ships from national or international origins as well as having the infrastructure to receive and discharge large quantities of biomass. Included within the application is the following:

- a power generation area;
- a fuel storage area;
- infrastructure corridors for cooling water pipelines and fuel conveyors; and
- an area of search for cooling water intake (from the Forth Estuary) and outfall infrastructure.

Fuel will be transferred from the storage area and from there to the power plant area via a covered conveyor system. An operational workforce of about 40 is anticipated. In addition, the project will also support 10 existing and 20 new port operation staff with respect to fuel handling.

Rosyth International Container Terminal

The proposal scheme involves the development of an International shipping container terminal on the former RD57 dry-dock site, originally created to allow for the refurbishment of nuclear submarines at the port of Rosyth in the early 1990's. The site itself lies to the west of the main port basin, on an artificially created peninsula of reclaimed land approximately 750 metres from the nearest residential properties in Rosyth and Limekilns.

Given the original intentions for the site, it is currently characterised by a large void area forming the dry dock. Finding a suitable use for this brownfield site has been highlighted as an economic priority for Fife within the Fife Structure Plan (2001-2011). Under the current proposals the dry dock would be flooded by creating a breach in the existing sea wall to the south, thus creating a berthing 'pocket' that would allow two container vessels to unload on each side of the pocket at any given time. Associated cranes would service the berth, with storage areas existing to the north and east of the berth for setting down unloaded containers while they await onward transportation. Staff parking would be located further to the north of the site, near the terminus of the former Rosyth Docks branch rail link. The removal of part of the southern sea wall will necessitate dredging of the Firth of Forth around the proposed cavity to allow a new channel to be opened up into the berthing basin.

It is anticipated that the proposed facility will handle approximately 400,000 twenty-foot containers per year (a similar figure to that handled by all the container facilities on the Forth and Clyde estuaries at the current time). It is planned that the facility will be operating at full capacity by 2022.

Ferry Terminal Expansion

Forth Ports PLC has plans to expand the ferry terminal and lorry handling areas at the western end of the terminal into a small section of the area known as Cromarty Campus.

The proposal includes a minor extension to the Restricted Employment Area and the principle of extending the terminal is accepted by Fife Council.

Forth Replacement Crossing

The Forth Replacement Crossing (FRC) is a major infrastructure project proposed by Transport Scotland, an agency of the Scottish Government. The FRC comprises a new cable-stayed bridge across the Firth of Forth and associated new and improved roads infrastructure to both the north and south of the bridge. The FRC project is currently on track to be delivered in 2016.

The existing Forth Road Bridge is showing signs of deterioration and is not suitable as the long-term main crossing of the Firth of Forth. The proposed scheme comprises a new bridge approximately 2.7km in length, approximately 3.6km of new mainline carriageway and 1.8km of upgrades to existing mainline carriageway. The key elements of the proposal are:

- upgrade of the A90 south of Admiralty Junction to Ferrytoll Junction;
- reconfigured Ferrytoll Junction and associated side road realignments/improvements;
- a new bridge to the west of the existing Forth Road Bridge;
- new mainline carriageway from the southern abutment of the Main Crossing, running west of South Queensferry to a new junction with the A904 ('Queensferry Junction');
- new mainline carriageway from Queensferry Junction running to the south of South Queensferry before rejoining the existing A90 west of Scotstoun; and
- improvements to M9 Junction 1A to provide improved functionality facilitating all movements (east and west to/from the M9). The works also include carriageway upgrades to the M9, south of Junction 1A.

Table 6.11 Comparison of cumulative effects in published plan or project proposals

SEA Objective	Rosyth Renewable Energy Plant	Rosyth International Container Terminal	Ferry Terminal Expansion	Forth Crossing	Commentary
A. Biodiversity and Nature Conservation *Protect and enhance habitats, species and ecosystems.*	-	-	-	-/+	The combined construction and operation of the proposals could have a cumulatively negative effect on local biodiversity. In particular, the dredging required for the construction of the Second Forth Crossing and the Rosyth International Container Terminal have the potential to significantly affect the Firth of Forth SPA. These may be compounded by accidental discharges to water from the SDP activities. There is also the potential for transport movements associated with the operation of each of the proposals, especially regarding the expected increase in HGV movements associated with the Rosyth International Container Terminal (905 vehicle movements are expected to be generated to and from the site per day when the site is at full capacity). Effects on biodiversity may include noise and vibration disturbance, the deposition of pollutants from vehicle exhausts and accidental spill risks (e.g. – fuel and oils) (although this risk is considered to be low). This may lead to additional effects during the construction phase of the SDP where higher HGV movements are expected compared to the operational phase. However, feasibility studies are currently being carried out on rail freight which would decrease the reliance on HGVs significantly. The proposed Rosyth Renewable Energy Plant will extract and discharge cooling water into the Firth of Forth Estuary. However, the expected volumes, the distance the proposed projects and the requirement for environmental permitting mean that the cumulative effects on biodiversity are not expected to be significant. . The transport improvements proposed within Forth Crossing may help to offset any cumulative negative effects on biodiversity arising from transport (e.g. – by reducing congestion). It is considered that 76% of the HGV traffic (672 per day) from the international container terminal will leave the site using the Forth Crossing which will prevent congestion in areas of biodiversity interest.

SEA Objective	Rosyth Renewable Energy Plant	Rosyth International Container Terminal	Ferry Terminal Expansion	Forth Crossing	Commentary
B. Population *Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts.*	+	+/-	+	+	It is envisaged that the construction and operation of the proposals will generate employment opportunities and wider economic benefits. For example Rosyth Renewable Energy Plant is expected to generate 40 operational jobs (which is comparable to the operational jobs likely to be supported by the SDP) and Rosyth International Container Terminal is expected to generate 135 operational jobs. It is expected that the number of operational jobs for the Forth Crossing will be minor but it is expected to bring further benefits and potentially attract more investment/business to the area(e.g. – through improved transport connections). There may be cumulative local economic benefits associated with employee spend (in terms of the provision of temporary accommodation, consumables and entertainment). The proposals may also cumulatively support the viability of existing and proposed community services as a result of an increase in the worker population. Increased traffic (especially from the 905 HGV movements per day from the International Container Terminal) may have a cumulative negative effect on local communities, due to noise, vibration and emissions., The transport improvements proposed for the Forth Crossing (retaining the current Forth road bridge as a dedicated public transport corridor and the new crossing carrying all other traffic) may help to offset any cumulative negative effects on local quality of life arising from transport (e.g. – by reducing congestion). Overall, is considered that cumulatively there would be a beneficial effect on the population objective, excepting the disturbance issues associated with the container port.
C. Health and Wellbeing *Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.*	0	-	0	+	There is potential for the construction and operation of SDP facilities and operation of the other proposals to cumulatively affect the health and wellbeing of residents who live in close proximity to the facilities and along transport routes (e.g. due to the impacts of air pollution). This is especially relevant for Rosyth International Container Terminal, which expects 905 HGV movements each day when the terminal is at full capacity (expected by 2022). However, effects from construction will be mitigated through implementation of a CEMP and all operational will be regulated and subject to environmental permitting requirements. Moreover, The transport improvements proposed within Forth Crossing may help to offset any cumulative negative effects on health arising from increases in vehicular movements arising from the construction and operation of the SDP (e.g. – by reducing congestion).
D. Noise and Vibration *Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration.*	-	-	-	-/+	The cumulative effect of increased traffic movements caused by the operation of the proposals, especially the increased movement of HGVs expected during the operation of the International Container Terminal, may have a significant cumulative negative effect on noise. This would be most likely to be an issue during the construction stage of SDP, especially for residential areas close to the Internal Container Terminal in Rosyth and Limekiln. However, traffic may be routed to avoid sensitive residential areas to decrease risk of negative effects. Furthermore, the transport improvements proposed within Forth Crossing may help to reduce congestion, especially within the area the A90 north of the Forth Bridge, where traffic noise is an issue, and may offset the increase in total vehicle movements in the long term, once in operation.
E. Geology and Soils *Minimise threats to the extent and quality of soils and geological resources.*	0	0	0	0	It is not considered that there will be a significant cumulative effect on this objective.

SEA Objective	Rosyth Renewable Energy Plant	Rosyth International Container Terminal	Ferry Terminal Expansion	Forth Crossing	Commentary
F. Water *Maximise water efficiency, protect and enhance water quality.*	-/0	-/0	-/0	0	All process and surface water discharges to the Firth of Forth from the operations of SDP facilities and Rosyth Renewable Energy Plant will be managed and are considered to be likely to be well below authorised limits. Therefore the likelihood of any cumulative impacts on water quality is considered to be low. There is a very small risk with respect to spills and leaks (such as oil or fuel) associated with the operation for all of the proposals. It is not expected that the magnitude of such occurrences would be significant and response to such events will be managed through the Environmental Management Plan, such that all spills will be contained. Given that Rosyth is not located within a Scotland Drinking Water Protected Area for surface water and groundwater and that all proposals will be within the requirements of abstraction licenses by SEPA it is not expected that there will be negative effects on water resource demand. The extraction of water from Forth Estuary for the operation of the Rosyth Renewable Energy Plant would be subject to a Controlled Activities Regulations (CAR) licence and is unlikely to lead to cumulative effects with other proposals.
G. Air *Minimise emissions of pollutant gases and particulates and enhance air quality*	-	-	-/0	+/-	Each of the proposals has the potential to increase traffic related air pollution, especially the increase in HGV movements expected during the operation of Rosyth International Container Terminal. However, the cumulative effects are unlikely to be in breach of national air quality standards, and there are no AQMAs within close vicinity of the sites (the nearest being Bonngate, Cupar which is over 40km to the north-east of Rosyth). Furthermore, the transport improvements proposed within Forth Crossing (retaining the current Forth road bridge as a dedicated public transport corridor and the new crossing carrying all other traffic) will help to reduce congestion, which is likely to help offset the increase in total vehicle movements in the long term. Cumulative negative air quality effects may be generated from the construction and operation of SDP facilities and the operation all the other proposals. However, it is envisaged that emissions would be managed through the environmental permitting such that effects would not be significant.
H. Climate Change and Energy Use *Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.*	+	-	-	-	Cumulatively, there is potential for the proposals to significantly increase energy consumption both through increased traffic movements and energy consumption once newly constructed premises are occupied. The Rosyth Renewable Energy Plant is expected to export up to 100 MWe of renewable electricity to the local electricity network and also, if feasible, renewable heat to local users (which could include SDP or the other proposals).
I. Coastal Change and Flood Risk *Minimise the risks from coastal change and flooding to people, property and communities.*	0	0	0	0	There is potential that any increase in impermeable surfaces following development of the proposals could result in increased localised flood risk. Given that the majority of the Rosyth dockyard lies within a flood plain and has a 1 in 200 yr (0.5% annual probability) of flooding, the cumulative effect of the development proposals could be to increase the risks of flooding. However, it is assumed that Flood Risk Assessments will inform development proposals and that appropriate measures to alleviate flood risk (e.g. SUDS) would be incorporated during the lifetime of the proposals such that there is not considered to be any significant cumulative effects on this aspect of the objective.

SEA Objective	Rosyth Renewable Energy Plant	Rosyth International Container Terminal	Ferry Terminal Expansion	Forth Crossing	Commentary
					Sea level rise as a result of climate change could increase the risk of flooding and of extreme weather conditions such as storm surge and wind induced waves from high winds, hurricanes and tornadoes which could affect the proposals.
J. Transport *Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.*	-	-	0/-	+	It is expected that the proposals will result in an increase in traffic movements in the Rosyth area. Cumulative effects may be particularly significant during the construction of SDP facilities, given the forecasted volume of ca. 905 daily HGV movements associated with operating the Rosyth International Container Terminal, which would lie adjacent to the SDP facility and could impact on local transport routes, although traffic can be routed to avoid travel through residential areas. However, the transport improvements proposed within Forth Crossing may help to reduce congestion, especially within the area the A90 north where congestion is currently a problem. This is likely to help offset the overall increases in traffic movement in the long term.
K. Waste Management *Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities.*	-	-	-	-	All four projects are likely to generate waste streams during construction (from sediment dredged from the estuary, to the demolition of structures). Whilst individually the projects (particularly the Second Forth Crossing) will generate significant quantities of waste, it is considered unlikely that there will be significant additional waste generated because of the interaction between projects. The SDP is not expected to significantly increase the amount of waste needing local treatment during operation, as virtually all of the recovered materials (whether hazardous or recyclable) will be sent away for further processing. Only process and personnel-related wastes will need management. There may, however, be some construction and eventually demolition-related wastes that will need to be processed – the amount will depend on the size of the facilities, with the RC storage option having the largest effect. Cumulatively, the proposals are expected to result in construction, excavation and operational industrial wastes that will need to be managed locally.
L. Land Use and Materials *Contribute to the sustainable use of land and natural and material assets.*	-/+	-/+	-/+	-/+	All sites identified for development are classified as previously developed land and as such, would be considered to beneficial reuse of a valuable resource. However, all projects would require the use of construction materials, to a varying amount. The SDP, as an industrial activity, fits well with the current use of the surrounding areas and also aligns with the other proposals. Continuing radiological work at the site could possible undermines the attractiveness of the area to prospective business in future; however, this is dependent on how the activities are perceived.
M. Cultural Heritage *Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features.*	0/-	0/-	0/-	0/-	The construction and operation of SDP facilities could, in conjunction with the other proposals (especially HGV movements related to developments, and the operation of the International Container Terminal) have a small negative effect on cultural heritage, due to air pollution and vibration. The SDP will continue maritime activity at Rosyth, following on from construction of the QE class Carriers. The area has largely moved away from naval work following the closure of HMNB Rosyth, and the other activities focus on civilian industry. Continuing naval work could be seen as a small positive, from the point of view of cultural heritage.
N. Landscape and Townscape *Protect and enhance*	-	-	-	-	The construction of a new bridge for the Forth Crossing proposal is likely to have the greatest ongoing visual impact in the area, although the greatest anticipated impact from the operation of this site would be at Ferry Hills which is less likely to be affected by the activities of the other

SEA Objective	Rosyth Renewable Energy Plant	Rosyth International Container Terminal	Ferry Terminal Expansion	Forth Crossing	Commentary
landscape and townscape quality and visual amenity					proposals. Each of the sites are likely to require the use of large scale equipment (such as cranes) which may have a visual impact, especially Rosyth International Container Terminal, Ferry Terminal Expansion and SDP facilities which are within close proximity. This could be particularly the case if the RC option of the SDP is taken forward. However, given that currently the landscape of Rosyth is dominated by the existing large crossing and to a lesser extent the activities occurring at Rosyth dockyard, it is considered that visual effect of the proposals will be considered as in keeping with the current landscape and the cumulative effect of each of the proposals is unlikely to be considered significant.

Score Key:	+ + **Significant** Positive effect		+ **Minor** positive effect		0 No overall effect		- **Minor** negative effect		- - **Significant** negative effect	? Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

6.8.4 Summary of Potential Cumulative Effects with other Plans or Proposals

Overall, with one exception it is not expected that cumulative effects of the SDP proposals with other plans and proposals will lead to significant additional effects. The exception concerns the potential for dredging within the Plymouth Sound and Estuaries SAC, required to maintain the DLCCP marina and which could be required to accommodate heavy lift operations for the RC option of the SDP proposals. This could have a significant effect on the marine environment and ecosystems. It should also be noted that some of the existing proposals (whether the Devonport AAP or the Second Forth Crossing) would have significant effects in their own right that the SDP is unlikely to lessen.

Whilst there have be no other significant effects identified, there is potential for some minor negative effects. These were noted for biodiversity and nature conservation, health and wellbeing, noise and vibration, air and cultural heritage primarily as a result of construction work occurring at the same time and as a result of increased traffic movements during operation. In consequence, in addition to adherence to permit requirements, any Construction Environmental Management Plans for the SDP will need to consider and address the cumulative effects of activities (such as timing and routing of HGV movements).

The development projects proposed in both Devonport and Rosyth will increase water consumption. At Devonport this could affect water resource availability as the River Tavy is over-abstracted at low flows, although potential effects would be assessed in the determination of any new abstraction licenses by the EA.

The proposals are also expected to result in a cumulative increase in energy consumption although this may be partially offset by proposals which incorporate energy provision (i.e. the EfW CHP at Devonport and Renewable Energy Plant at Rosyth) and, in the case of Devonport, aspirations for new development in the area to meet high standards of energy efficient design/onsite renewable generation (as set out in the Devonport AAP).

Waste generation will increase due to the implementation of the plans and proposals. However, it is expected that a large proportion of waste arisings would be reused or recycled whilst the proposed EfW CHP in Devonport would serve to recover residual waste, in accordance with the waste hierarchy.

The use of large scale equipment (such as cranes) at the Container Terminal, Ferry Terminal Expansion and SDP facilities may have a cumulative negative effect on landscape and townscape in Rosyth although in view of the existing landscape character and built form, any effects are not expected to be significant.

All proposals will generate employment opportunities and wider economic benefits which are expected to have a cumulative positive effect with respect to the population objective. The proposals may also cumulatively support the viability of existing and proposed services and facilities and, in the case of Devonport, the wider regeneration of the area (although it is acknowledged that there is a risk that SDP proposals may affect these aspirations should they be viewed negatively).

7. Conclusions and Key Findings

7.1 The Need for the Submarine Dismantling Project

Is the SDP actually needed? Would not a programme of indefinite afloat storage provide an adequate alternative to those proposals that anticipate removing and storing the ILW arising from the redundant submarines, sending the LLW to a licensed disposal site and recycling the remaining (non-radiological) fore and aft sections of the submarine?

Indefinite afloat storage assumes that the maintenance programmes and review of hull integrity would continue, irrespective of the costs associated (which are expected to increase significantly as the existing submarines age and the remaining ten submarines in service submarines come out of service). In consequence, a maintenance team, approximately one tenth of the size of those envisaged for the SDP proposals, would be actively engaged in providing this service, 'indefinitely'.

The provision of indefinite afloat storage also requires adequate and suitable afloat storage capacity. This would mean identifying and providing additional capacity at Devonport at some point after 2020, which would eventually affect other MOD operations or services. Further docking facilities would also be needed at Devonport to safely store the Vanguard Class submarines, which could feasibly have adverse effects on the marine environment during construction. At both sites, using valuable dockside facilities for indefinite storage will also prevent other, potentially more beneficial, income generating activities from taking place.

Deferring dismantling of the Reactor Compartments or Reactor Pressure Vessels would however allow the radioisotopes to decay naturally over time (as would the RC and RPV options in the SDP). A significant reduction could be expected in gamma emissions from the decay in the short-lived isotopes within the RPV, such as Cobalt 60. This in turn would reduce the amount of shielding needed in the size reduction facility. However, the activity of longer lived isotopes such as Iron 55 and Nickel 63 will only fall slightly, so the quantities of ILW would remain largely unaffected for many decades.

Indefinite afloat storage is perhaps a misleading title, as the concept of an 'indefinite' period, whilst theoretically possible, would require a commensurate and ever growing financial commitment. The long-term viability of such a position remains questionable. It is therefore assumed that eventually submarine dismantling will occur (including the need for size reduction and segregation facilities) and so the range of effects described for the SDP options could also be expected to occur at some future point for the 'do-minimum' option.

Indefinite afloat storage (as an extension of current afloat storage) would also not be consistent with the MOD or wider Government decommissioning policies. These require that dismantling should be carried out "as soon as reasonably practicable", although it is conceded that in practice this may span a number of stages and decades. The concept of indefinite afloat storage also sits uneasily with the aims of the project, namely to ensure that the implementation of any solution inspires public confidence, is safe, environmentally responsible, secure and cost-effective.

In consequence, unless an open financial commitment is given and the MOD and wider Government policy position is changed, the imperative remains to take action and provide a timely and cost effective solution. This leads to the conclusion that doing 'something' (with its associated short and medium-term environmental effects) is both necessary and preferential to maintaining afloat storage, with its long-term environmental effects and its failure to remove the legacy of laid-up submarines. It is certainly the case that the ‘do minimum’ option cannot be assumed to have a minimal effect on the environment as the submarines age and increase in number.

7.2 What are the Environmental Effects of Submarine Dismantling?

7.2.1 The Generic Environmental Effects of Constructing SDP Facilities

Construction of the initial dismantling, interim storage and size reduction/ packaging facilities (Stages I and II) will have a range of effects broadly similar to any large dockside construction project. Specific effects are directly related to the size, nature and phasing of any proposed dismantling facilities, the resources required and the characteristics of the surrounding environment.

The potential environmental effects were found to be associated with:

- The direct effects of land take, which may lead to the loss or severance of habitats, the loss of species and long term disruption to populations. This is unlikely to be an issue at the existing sites, which are already built up; however it could be significant on a new, undeveloped (‘greenfield’) site - especially if new coastal development, which could affect coastal processes, were needed.
- Short and long-term effects on marine and intertidal environments, and on water quality, from any dredging necessary to establish deep-water channels to accommodate submarine movement. Dredging would be most likely if a new or previously-abandoned coastal site were developed, wherein the effects could be significant.
- The visual impact of building the facilities and the facilities themselves, and the potential this would have to affect landscape character. The scale of the impact is directly related to the size of the development as well as the surrounding landscape. As a result, the development would be likely to have a significant effect on an undeveloped site in a more rural area. On the existing sites, the effects are only likely to be significant for the RC separation and storage option (SEA Option 1), which has a total footprint of around 29,000 m^2.
- The use of energy (and associated carbon footprint) from plant operation, lighting, heating, transport and the embodied energy in the building materials. The scale of the effect would be linked to the scale of development, so could feasibly be more significant for a new development than the adaptation of the existing dockyards, where much of the infrastructure would already be in place.
- Potential disruption, disturbance and nuisance from noise, vibration, light, dust or pollutant gasses during development, both on site and around transport routes. This effect would increase in line with the extent of development, so could be significant for a new site, especially on undeveloped land.
- The use (and discharge) of water from the construction site, and the effects this could have on water quality. This could be significant for an undeveloped site.

- The use of natural materials (including timber, aggregate and metals) for development, and construction-related waste. The size of the effect would again be related to the scale of development and is likely to be significant for new facilities on undeveloped land.
- The potential for any existing contaminants within the soil to be mobilised into air or water during groundwork. This effect is highly site-specific, although the risk would be higher on reclaimed or previously-developed land, where the presence of historic contamination is more likely (though of course not certain).
- Construction-related effects on worker health and safety. These would be as per any industrial development, and would be mitigated effectively through normal safe working practice.
- Given their coastal location, there is also the potential for initial dismantling facilities (and possibly interim storage facilities) to be at risk of flooding, and to affect coastal flood risk off-site. Flooding may damage facilities, disrupt activity, create health and safety risks and potentially mobilise pollutants and hazardous materials. The effects of the development on off-site flood risks is highly location dependant, but will increase in line with the extent of land take and the degree of re-profiling undertaken, so could be significant for new facilities on undeveloped land.
- There is the potential to affect the attractiveness of the surrounding area to the existing local community, new potential residents and inward investors, and so affect land use patterns. However, this is highly subjective, and would be very much dependent on how the project is perceived by stakeholders.
- The potential to affect cultural heritage assets in or adjacent to, the proposed development is highly site-specific, and would depend on the amount of new development needed. It could be significant on undeveloped land due to the risk of affecting buried archaeology.
- Construction could have potentially significant positive socio-economic effects, by creating or sustaining jobs and through the use of local supply chains. The scale of the benefit would be directly related to the size of the facility (and associated capital investment). There may also be potential to offer training opportunities associated with SDP activities (e.g. apprenticeship schemes) for benefit of the local community.

7.2.2 The Generic Environmental Effects of Undertaking Submarine Dismantling (Stages III - VI)

The operation of the dismantling facility/ies was found to have a range of environmental effects, with the effects on waste being considered significant. Laid up, intact submarines are not formally classified as waste; however as soon as the extracted components leave the site, they become waste for the purposes of waste management law. The SDP will therefore create multiple waste streams where previously there were none. This includes an estimated 513 – 1,566 tonnes of ILW, and between 2,457 and 4,158 tonnes of LLW from the 27 submarines; however of this, it is expected that only 108 – 1188 tonnes of LLW will ultimately need to be disposed of, as the rest of the metals that left the submarines as LLW could be decontaminated and recycled.

The vast majority of the material arising from the submarine hulls (more than 100,000 tonnes in total) will be high-grade steels and other valuable metals such as copper and other precious metals in wiring and in electronic components. All of these will be recyclable. There will be some hazardous materials remaining on the submarines that could not be removed when they were taken out of service. These include asbestos, plastics containing heavy metal stabilisers, Potassium Chromate in the Primary Shield Tank and residual oils and lubricants.

Other, more minor environmental effects of dismantling operations include:

- The effects on sensitive receptors such as natural habitats and wildlife, heritage assets and local communities from operational disturbance (e.g. dust, noise, vibration, light pollution, traffic and exhaust emissions) from initial dismantling and the movement of staff, submarines, wastes and equipment. However, subsequent size reduction and packaging (after interim storage) would be undertaken within a shielded technical facility and consequently, associated disturbance and emissions will be contained and minimised.

- Any anxiety in the local community about the *perceived* health risks of radioactive waste management, which could in itself increase stress levels. The SEA found no evidence of likely impact on either the environment or peoples' health from the planned activities. Current estimates indicate that radiological doses to 'critical' group (i.e. those people with the highest feasible exposure) would be significantly less than 0.3% of the statutory limit of 1 mSv per year. This compares to the UK average annual dose from all sources, including natural radiation, which is about 2.7 mSv per year across the country (and higher in South-West Devon.) The likelihood of any unplanned radiological *or* non-radiological discharges during initial dismantling are considered remote; this reflects the nature of the waste, which is largely activated steel, the environmental containment measures that the law requires, and the lack of pathways for radioactive materials to reach any critical groups.

- Effects on worker health and safety. Estimates of worker's exposures to radioactivity vary as a function of the different initial dismantling options, when these would occur and the estimated number of workers involved. Options that require incursion into the RC sooner (e.g. the RPV and packaged waste options) will lead to an increase in worker dose, although such activities are still expected to represent less than one tenth of the annual individual worker dose limit of 20mSv. Non-radiological effects would be as per any industrial development, and could include respiratory problems from dusts or accidents arising from slips, trips and falls. These risks would increase in line with the scale of operations, and would have to be mitigated effectively through standard safe working practices.

- The effects on local water resources from additional demand for water (associated with cutting, dust suppression, damping down and for personal use).

- The effects on water quality from wastewater and storm-water discharges. Any discharges would need by law to be within discharge permit limits set by the regulator, so that any effect on water quality would only be associated with accidental spill or an unplanned event such as a localised flood. Any effect on the aquatic environment would be a dependant on the chemical and biochemical characteristics of the receiving waters.

- Given their coastal location, there is the potential for the initial dismantling facilities (and possibly interim storage facilities) to be at risk of flooding. This could be mitigated by maintaining effective flood defences, although in low-lying areas this may become very expensive and has the potential to affect flood risks off-site.

The operation of the initial dismantling facility/ies was also found to have a range of positive effects:

- The need for a small number of highly-skilled workers for the duration of dismantling activities, the majority of which will require specialist nuclear expertise. The extent to which these posts benefit the local community will depend on the numbers required the availability of existing staff to do the work and the local labour market.
- Postponing RC/ RPV size reduction until after interim storage may act to decrease the overall energy used. This is due to the potential for more energy-efficient dismantling techniques to be developed over time, plus the progressive de-carbonisation of the UK electricity network (post 2030, generators will have substantially reduced carbon emissions in line with the Climate Change Act (2008) targets).
- Dismantling will, over the longer term, generate financial savings by reducing costs associated with current afloat storage. This will have a positive effect in relation to national public economic spend. It will also free the dockyards to pursue other commercial activities.

7.2.3 The Generic Environmental Effects of Decommissioning SDP Facilities (Stage VII)

The decommissioning of the facility would involve demolishing the initial dismantling, size reduction and interim storage facilities once the last ILW is sent to the proposed GDF and the sites are declared surplus, and returning the site(s) to their original land use type.

This was found to have a range of environmental effects, a number of which were significant, including:

- Long term positive effects on biodiversity and nature conservation from the restoration of the site to the original (or enhanced) state – especially for undeveloped sites. However, there may be short and medium term negative effects arising from disturbance, discharge and emissions arising from the decommissioning and demolition activities required.
- Negative effects on population from the cessation of dismantling activities causing a loss of high skilled jobs. However, decommissioning activities will create some short term employment opportunities. Specific skills and technologies will also be needed to support the dismantling of the size reduction facility, given that it could be radiologically contaminated. Following restoration, the site may then be sold for other appropriate economic uses which may create wider long term employment opportunities.
- Negative effects on the waste objective from the considerable amounts of demolition waste. However, it is expected that the majority of this could be reused or recycled. There will also be radioactive waste produced when the size reduction facility is dismantled, which is likely to include steel and concrete as well as contaminated tools and equipment. This will need to be packaged and transferred to the proposed GDF or the LLW facility (as required). At this stage, the quantities of ILW and LLW from decommissioning are unknown but are not anticipated to be significant.
- Negative effects on the transport network from the significant number of HGV movements required to transport the substantial volumes of waste/ recyclate created from decommissioning and demolition. In the longer term the cessation of operational activities is

expected to have a positive effect on the transport objective by reducing the volume of associated traffic on local road networks.

- Effects on landscape and townscape, which in the long term could be significantly positive, depending on the extent to which the facility was in keeping with the surrounding landscape and townscape. By contrast, there is always the potential that the facilities could become 'part of the landscape' so that removing them could have a negative effect on townscape character.

Minor effects associated with the decommissioning activities would include:

- Potential disruption, disturbance and nuisance from noise, vibration, light, dust or pollutant gasses during demolition and excavation, both on site and around transport routes. The severity of these effects would largely be linked to the size of the facility and the original land use, but would also be dependent on the proximity of sensitive receptors and the existing baseline conditions at the time of decommissioning.
- Effects on worker health and safety, as per any site clearance project. This could be mitigated effectively through normal safe working practice.
- Energy use (and effects on the climate change objective) from demolition equipment and associated traffic.

7.2.4 What are the Environmental Effects Associated with the Technical Options for Removing the Radioactive Materials?

The breadth of environmental effects is similar between the three differing technical options (RC separation and storage, RPV removal and storage, and RPV removal and size reduction to packaged waste). However, their magnitude, duration and significance will vary considerably, depending on the following factors:

- **When** intrusive works are undertaken within the RC, particularly removing and dismantling the RPV and steam generator, since any delay will benefit from radioactive decay of the short lived gamma emitting isotope Cobalt 60, which will reduce worker dose.
- **The number and complexity** of dismantling stages and activities required. Theoretically, the same activities will have to be carried out, with the only difference being in timing. However, there is the possibility (though not yet confirmed) that the RPV could be disposed of to the proposed GDF intact. If this were to occur, the worker dose related to size reducing the RPV could be avoided.
- **The size of the facilities.** All technical options will require a dry dock of around 7,500m^2 and dockside facilities of around 5,000 m^2 to work on the submarines. The RPV and Packaged Waste options will require further processing waste segregation facilities of around 5,000m^2. The footprints for the interim store vary considerably, with the RC store requiring 11,600m^2 of flat land, the Packaged Waste option requiring a facility of 1,005m^2 and the RPV storage facility requiring a facility of 801m^2.
- The **way** in which the submarines and the radiological materials are moved, and the **number of movements** needed.

- **Where** the facilities are sited. Variables will include the nature and condition of the local environment, the characteristics of the local community (e.g. proximity to site, density of housing, socio-economic status) and other developments that are likely to take place at the same time as SDP activities. The influence of this factor is considered in **Section 7.2.3** on siting and the integrated options.

RC Option

When considered together, RC separation and storage performs clearly less well against the SEA assessment objectives than the other two options. This reflects the scale of the interim storage facility needed, the additional dismantling activities involved (post storage dismantling of the RC, on site recycling of the non-irradiated parts of the RC, heavy lift vessel transportation of the fore and aft sections of the processed submarine). The potentially significant environmental effects associated with the RC option concern direct land take and loss of biodiversity resource, cultural heritage assets, soil and geology assets. Depending on transport options, they could also include channel dredging to accommodate a heavy lift ship to move the residual fore and aft sections of the submarine and/ or the RC, and its impact on the marine environment and ecosystems.

The scale and duration of these negative effects need to be considered against a principal benefit of the RC option, namely that it is associated with the lowest radiological dose to workers, noting that for all technical options, occupational doses are estimated to remain low (with exposure estimates significantly or very significantly below annual worker dose limits).

There are no anticipated effects on the public from radiological discharges as a result of any planned dismantling activities, and the risk of significant discharge into the environment in the event of an accident is considered to be remote.

RPV and Packaged Waste Options

The RPV and Packaged Waste options perform similarly against the SEA objectives, reflecting similarities in activity and size of facility footprints. The removal of the RPV ‘up front’ from the submarine is common to both options. In consequence, there are fewer benefits from isotope decay and occupational dose to workers than for the RC option.

For the packaged waste options, all dismantling activities would be undertaken immediately. As a result, the magnitude of negative effects across the majority of the assessment objectives would increase during initial dismantling; however there would be limited environmental effects in the longer term, as the ILW would not need to be processed again at a later date.

For the RPV storage option, deferring the majority of the size reduction activities for 30-plus years does present a number of potential benefits or opportunities:

- the short lived isotope Co60 in the activated steel would have more time to decay naturally, this reducing the main source of occupational dose to workers;
- delay may also allow size reduction and segregation technologies to develop, and potentially reduce radiological and non-radiological emissions;
- delay may allow for clarification and direction on the final form of ILW container that would be acceptable to the proposed GDF, which may affect technologies employed and the extent to which size reduction is needed; and
- delay may allow for the increased use of low carbon technologies, reducing the carbon

footprint of the dismantling process.

Although the RPV and Packaged Waste options perform similarly well against the SEA objectives, the RPV option has been assessed as the better performing technical option. This option requires construction of the smallest of the three proposed interim storage facilities with a commensurate effect on the scale and duration of construction and decommissioning activities; in addition, this option also allows for the in-situ decay of short lived ILW during interim storage and does not foreclose on future opportunities for enhancing dismantling technologies which could reduce waste volumes and/ or minimize occupational dose still further.

7.2.5 What are the Environmental Effects Associated with Location?

Overall, an existing Licensed/ Authorised site has been assessed as the best performing generic land use option. Locating SDP facilities on existing sites Licensed or Approved by the UK nuclear regulators would make the best use of existing infrastructure and facilities. As a result, the scale and duration of construction and decommissioning activities (and the associated environmental impacts) would be significantly reduced relative to an undeveloped, ‘greenfield’ site, with the magnitude of effects similar to, but less, than a previously-developed, ‘brownfield’ site.

Two existing Licensed/ Authorised sites are proposed as candidates for initial dismantling: Devonport Dockyard and Rosyth Dockyard. Both locations are well established dockyards with naval heritage and connections to the UK’s nuclear submarine fleet management. Both have environmental sensitivities associated with their locations; however, Devonport has a number of specific characteristics that mean that environmental concerns will always be heightened when any new developments are proposed, namely:

- Devonport Dockyard is located in a built up and less advantaged area of Plymouth. In addition to industrial and commercial land uses, the site is adjacent to long-established (and growing) residential areas. These areas experience multiple deprivations, with their associated health inequalities. The communities living in close proximity to the site are therefore likely to be sensitive to the health effects of industrial development. By contrast, Rosyth dockyard is situated in a less built up and populated area on the edge of the town of Rosyth, with the surrounding area comprising some commercial and industrial land uses.
- Plymouth City Council anticipates that the area is a focus for development and regeneration through the Devonport Area Action Plan, and anticipate that the population will increase substantially from approximately 5,000 in 2005 to an estimated 6,500 in 2016. This could increase issues related to disturbance.
- The Plymouth Sound and Estuaries Special Area of Conservation (SAC) is directly adjacent to Devonport dockyard (this includes all waters in the tidal basins), and the Tamar Estuaries Complex Special Protection Area (SPA) and Ramsar Site is located approximately 1.4km south-west of the dockyard. Rosyth is 0.3km at its closest point to the Firth of Forth SPA and Ramsar site. Any SDP activities would need to avoid damaging the features for which these areas have been designated.
- The importance of the marine environment and its high conservation value would affect any proposals where dredging were required. It could be a particularly significant issue in

Plymouth Sound (which has restricted water depth), if the RC storage option is adopted and a heavy-lift ship is found to be <u>the only way</u> in which fore and aft sections of the submarine could be moved. Therefore the movement of the submarines and the subsequent transport of the 'processed' submarine (and, if required, the intact RC) should, if the least environmental damage is to occur, take place via an open water or barge tow.

- Devonport has a greater concentration of heritage buildings than Rosyth, containing five scheduled monuments (four in the recently privatised South Yard/ one at Bull Point) and 85 listed buildings (also predominantly in South Yard and Bull Point.) In addition, Devonport Conservation Area and Devonport Registered Park and Garden are located immediately south of Devonport dockyard, and the Grade II* Antony Registered Park and Garden is located approx. 1.1km away across the Hamoaze Estuary. Any activities will have to be sensitive to these heritage features. However, the SDP does bring the potential for redundant historic buildings to be reused.

For these different locations, a range of SDP options have been considered. A summary of the environmental effects of the proposed options is presented in **Table 7.1.**

Table 7.1 Summary Assessment of the Environmental Effects of the Integrated Options

SEA Integrated Option	Location	A: Biodiversity and Nature Conservation	B: Population	C: Health and Wellbeing	D: Noise and Vibration	E: Geology and Soils	F: Water	G: Air	H: Climate Change and Energy Use	I: Coastal Change and Flood Risk	J: Transport	K: Waste Management	L: Land Use and Materials	M: Cultural Heritage	N: Landscape and Townscape
0: Do Minimum		-/--	--/+	0	-	0	-	0/-	0	0/-	0	0/-	0	0	-
1: RC separation with storage at point of waste generation	1D	--/?	-/+	0/-	-	-/?	-	-	-/?	0/-	-	-/+	-/+	-	-/--
	1R	0/-	-/+	0/-	-	-/?	-	-	-/?	-	-	-/+	-/+	0	-/--
	1B	--/?	-/+	0/-	-	-/?	-	-	-/?	0/-	-	-/+	-/+	0/-	-/--
2: RPV removal with storage at point of waste generation	2D	-	-/+	0/-	-	-/?	-	-	-/?	0/-	-	-/+	-/+	0/-	0/-
	2R	0/-	-/+	0/-	-	-/?	-	-	-/?	-	-	-/+	-/+	0	0/-
	2B	-	-/+	0/-	-	-/?	-	-	-/?	0/-	0/-	-/+	-/+	0/-	0/-
3/4: RPV removal with storage at a 'remote' site	3/4 D	-/?	-/+ /?	0/- /?	-/?	-/?	-/?	-/?	-/?	-/?	-/?	-/+ /?	-/+ /?	-/?	-/?
	3/4 R	-/?	-/+ /?	0/- /?	-/?	-/?	-/?	-/?	-/?	-/?	-/?	-/+ /?	-/+ /?	-/?	-/?
	3/4 B	-/?	-/+ /?	0/- /?	-/?	-/?	-/?	-/?	-/?	-/?	-/?	-/+ /?	-/+ /?	-/?	-/?
5: Packaged waste storage at the point of waste generation	5D	-	-/+	0/-	-	-/?	-	-	-/?	0/-	-	-/+	-/+	0/-	0/-
	5R	0/-	-/+	0/-	-	-/?	-	-	-/?	-	-	-/+	-/+	0	0/-
	5B	-	-/+	-/0	-	-/?	-	-	-/?	0/-	0/-	-/+	-/+	0/-	0/-
6/8: Packaged waste storage at a 'remote' site	6/8 D	-/?	-/+ /?	0/- /?	-/?	-/?	-/?	-/?	-/?	0/- /?	-/?	-/+ /?	-/+ /?	0/- /?	0/- /?
	6/8 R	0/- /?	-/+ /?	0/- /?	-/?	-/?	-/?	-/?	-/?	0/- /?	-/?	-/+ /?	-/+ /?	0/?	0/- /?
	6/8 B	-/?	-/+ /?	0/- /?	-/?	-/?	-/?	-/?	-/?	0/- /?	0/- /?	-/+ /?	-/+ /?	0/- /?	0/- /?

Score Key:	+ + Significant Positive effect	+ Minor positive effect	0 No overall effect	- Minor negative effect	- - Significant negative effect	? Score uncertain

NB: where more than one symbol is presented in a box it indicates that the SEA has found more than one score for the category. Where the scores are both positive and negative, the boxes are deliberately not coloured.

Due to a combination of the *possible* effects on the Plymouth Sound and Estuary SAC, in conjunction with the scale and duration of the negative effects associated with the facilities required (particularly the interim storage facility) and the additional dismantling activities involved, RC removal and storage at Devonport (or in combination as dual site with Rosyth) is the poorest performing integrated option against the environmental assessment objectives. Implementing the RC option at Rosyth would not require capital or maintenance dredging; however, it still has minor negative effects on 9 of the 14 environmental objectives.

The RPV and packaged Waste options perform similarly against the SEA objectives at both locations. Given the greater environmental sensitivities and proximity to growing residential areas at Devonport, removing the radioactive materials from the submarines at Rosyth performs marginally better against some of SEA objectives than removing the radioactive materials at Devonport. However, **none** of these differences are environmentally significant, unless the RC separation option is chosen and the only way of moving them in and out of the site is by heavy-lift ship.

7.2.6 What's missing from the Assessment?

The developing nature of the NDA's approach to shared facilities, and the need to screen any potential commercial sites through expressions of interest, mean that it has not been possible at this stage to name any potential candidate sites for interim ILW storage, beyond those at the point of waste generation. So, whilst the environmental effects of interim storage at either Devonport or Rosyth (as points of waste generation) have been considered *at a strategic level* in the integrated options assessment, the performance of other sites has not been considered in anything other than generic terms (e.g. as 'remote' sites, owned by the MOD, the NDA or Commercial operators). Necessarily, this produces a constraint on the conclusions.

All options except the NDA storage option assume that a new build storage facility will be required. In consequence, it is anticipated that, if using NDA facilities does not prove feasible, a further environmental assessment would be needed in support of the assessment for candidate storage sites.

Whichever site(s) are eventually chosen, further site-specific environmental assessments will be needed before any development can take place. These are likely to include (but not be limited to) Town and Country Planning Environmental Impact Assessment, Environmental Impact Assessment for Nuclear Decommissioning and Environmental Permitting[32].

7.2.7 Proposals for Mitigation

The assessment of the SDP stages has identified a number of mitigation measures which could be implemented to avoid or minimise any potential negative effects, and to enhance the positive effects. These measures are included within each of the topic-based assessments in **Appendix A.** Those which cut-across a number of the SEA objectives are summarised in **Table 7.2** below. At this strategic stage, these measures are captured as themes rather than detailed measures at that would be better suited to

[32] The Town and Country Planning (Environmental Impact Assessment) (Amendment) (England) Regulations 2008, plus devolved equivalents; the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999; and the Environmental Permitting Regulations 2010

future site-level assessment. These measures include the generic issues identified in the assessment of the Integrated Options. Note that some of these mitigation measures are Statutory, or are a requirement for obtaining Planning Permission.

Table 7.2 Proposed environmental mitigation measures for submarine dismantling

Proposed mitigation measures for developing the initial dismantling and interim storage facilities
• Avoid development and/or additional dredging in designated nature conservation sites, especially if this could damage the features for which the site is protected. • Implement a Construction Environmental Management Plan (CEMP) and a Waste Management Plan during construction to minimise disturbance (especially from noise, vibration and light), emissions into the environment and wastes. A waste minimisation strategy should also be used, to identify where waste arises in design, procurement and logistics, and to set out clear mechanisms for reducing waste. • Implement an Environmental Management System (EMS) for the whole life of the project, to minimise effects on the environment or local communities. • Minimise the size of new development to limit land-take, use of natural resources and reduce the risk of pollution and flood risk. • Complete Flood Risk Assessments, including a surface drainage strategy and allowance for climate change. • Minimise and manage traffic movements to reduce air pollution and congestion (particularly in built up areas or those with existing air quality problems), and consider the use of shipping or rail to move construction materials. • Inform the public of developments on an ongoing basis, e.g. by attendance by community meetings and development of educational opportunities. • Use local workers and suppliers where possible, and consider training opportunities (e.g. apprenticeship schemes). • Ensure that UK Government standards for sustainable procurement and efficient building design are included and enforced in all construction and operational contracts. This could include using local materials and those with lower embodied energies; just in time delivery, considering minimisation of whole-life carbon footprint in the design and build of the facilities and integrating low and zero-carbon technologies. • Consider designing the facilities, especially any buildings, in a way which complements the local area and harmonises with any key views or designated landscape areas. • Determine the historic and archaeological value of the site(s) at the earliest stage and take appropriate steps to address any issues arising. This could include reusing any vacant historic buildings. • All of the above should be included in any tender specifications for construction contracts.
Proposed mitigation measures for removing the radioactive materials from the submarines
• Consider routing and timing of submarine transport to avoid protected areas and minimise impacts on sensitive receptors. • Communicate with the public on an ongoing basis to help reduce anxiety relating to site operations • Seek to use local contractors and suppliers where possible. Any potential to offer training opportunities (e.g. apprenticeship schemes) should be pursued. • Adopt best practice procedures for the protection, storage and handling of materials. A robust logistics plan should be developed, identifying how materials are to be moved to, from and on site and how they are stored. • Continue using a Site Waste Management Plan and a waste minimisation strategy to identify where waste arises in design, procurement and logistics and to set out clear mechanisms for reducing waste.

• Consider whether to conduct an environmental assessment of transporting the residual submarine hulls to the ship recycling facility. • Minimise the distance travelled by the intact submarines, the residual hull sections and other waste streams. Consider using the most efficient/ least damaging modes of transport where possible, and manage HGV movements to minimise congestion and air quality problems (especially for areas with existing AQMAs.) • Ensure an emergency preparedness plan is in place setting out responses to unplanned events. • Implement waste minimisation and waste management best practice, with a focus on materials resource efficiency (in accordance with WRAP and Defra guidance). This should include consideration of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, and the EU Strategy for Better Ship Dismantling. • Follow best practice procedures for the protection, storage and handling of materials.
Proposed mitigation measures for transporting submarines, RCs/ RPVs/ Packaged Waste and other materials
• Minimise the distance travelled by the submarines, the removed RCs/ RPVs/ packaged waste and the residual hulls; consider using the most efficient/ least damaging modes of transport. • Avoid the use of a heavy-lift ship (or any similar method) to transport submarines, RCs or residual sections, where this would require additional dredging to be carried out. • Manage HGV movements in and out of site to minimise congestion, disturbance and air quality problems. • Ensure that transport mechanisms and the interim storage facility have emergency response plans to address any potential unplanned events.
Proposed mitigation measures for decommissioning the SDP facilities
• Many of the proposed measures cut across a number of assessment objectives and include: • Determine the historic value of the site(s) at the earliest stage and take appropriate steps to address any issues arising. This would only be needed if the facilities had become important landmarks in their own right. • Limit noise, vibration dust and mobilisation of any contaminants during demolition as part of a Demolition Environmental Management Plan (DEMP). • Continue using a Site Waste Management Plan and a waste minimisation strategy to identify waste streams and to maximise the amount of materials recycled. • Inform the public of developments on an ongoing basis, e.g. by attendance by community meetings. • Seek to use local workers and suppliers where possible. • Consider using mains electricity to power equipment and plant, to minimise air pollution from diesel and oil-powered demolition plant. • Manage traffic movements to minimise disturbance, congestion and air quality problems (especially for areas with existing AQMAs.) The potential for using shipping to move demolition materials/ wastes should be explored. • All of the above should be included in any tender specifications for demolition contracts.

7.3 Proposals for Monitoring

It is a requirement of the SEA Directive to establish how the significant effects of implementing the SDP will be monitored. Current proposals for monitoring will centre on the effects identified to date; however, these may change as a result of consultation (particularly if new significant effects are identified). They should also be revised following identification of candidate sites for interim ILW storage.

As set out in ODPM Guidance, *"it is not necessary to monitor everything or monitor an effect indefinitely.*

Instead, monitoring needs to be focused on significant sustainability effects."

Monitoring should therefore be focused on:

- the significant effects identified in the appraisal that may give rise to irreversible damage, with a view to identifying trends and where appropriate to implement relevant mitigating measures before such damage is caused; and
- uncertain effects where monitoring would enable preventative or mitigating measures to be undertaken.

Taking this into account, of the 14 topics considered in this SEA, it is proposed that monitoring should focus on the following, as set out in Table 7.3.

Table 7.3 Potential Environmental Monitoring Measures

SEA Objective	Monitoring Measure	Source(s) of Information
A. Biodiversity and Nature Conservation	• Condition Reports for Designated Sites	Natural England and/or Scottish Natural Heritage.
B. Population	• Employment Information (number, category for SDP proposals and local authority in which proposals are sited) • Number of apprenticeships offered	Facility operator(s) National Statistics, ONS
C. Health and Wellbeing	• Radiological Exposure to workers; TRIR; RIDDOR rates • RIFE radiological dose levels • National Statistics – Long term illness, etc.	Facility operator(s), HSE, ONR, EA and/or SEPA **Radioactivity in Food and the Environment (RIFE) Annual Reports** (Food Standards Agency (FSA), the Environment Agency, SEPA, and the Environment and Heritage Services of Northern Ireland). National Statistics
D. Noise and Vibration	• Monitoring of noise levels at facilities • Number of complaints received requiring mitigation or abatement notice	Facility operator(s) Local authority's environmental health department/Annual Monitoring Report
E. Geology and Soils	N/A	

SEA Objective	Monitoring Measure	Source(s) of Information
F. Water	• Consented/ permitted aqueous discharges • Water quality monitoring • Water Use	**Radioactivity in Food and the Environment (RIFE) Annual Reports** (Food Standards Agency (FSA), the Environment Agency, SEPA, and the Environment and Heritage Services of Northern Ireland). Environment Agency and/or SEPA Facility operator(s)
G. Air	• Authorised gaseous discharges of radioactivity.	**Radioactivity in Food and the Environment (RIFE) Annual Reports** (Food Standards Agency (FSA), the Environment Agency, SEPA, and the Environment and Heritage Services of Northern Ireland).
H. Climate Change and Energy Use	• Energy consumption at facilities.	Facility operator(s)
	• Emission of greenhouse gases	Facility operator(s)
I. Coastal Change and Flood Risk	• Flood risk	Facility operator(s), EA and/SEPA
J. Material Assets (Transport)	• Traffic activity levels around sites (Annual Average Daily Traffic Flows)	Department for Transport Local authority
K. Material Assets (Waste Management)	• Volume of construction waste and proportions recycled • Volume of hazardous waste • Volume of controlled wastes and proportions recycled • Volumes of LLW and ILW arising	Facility operator(s), EA and/SEPA
L. Land Use and Materials	• Quantity of materials ordered by sites / facilities	Facility operator(s)
M. Cultural Heritage	• Condition of historic assets	Facility operator(s), English Heritage and/or Historic Scotland; Cadw
N. Landscape and Townscape	• Changes in the visual appearance of facilities.	Relevant Landscape Character Assessments EIA associated with the facility or other major developments in the area.

7.4 Quality Assurance

The Government's Guidance on SEA contains a quality assurance checklist to help ensure that the requirements of the SEA Directive are met. Those relevant to this stage have been highlighted below.

Table 7.4 Quality Assurance

Objectives and Context	
The plan's purpose and objectives are made clear.	Presented in **Section 2**.
Environmental issues, including international and EC objectives, are considered in developing objectives and targets.	International and European objectives and targets are identified in **Appendix A**.
SEA objectives are clearly set out and linked to indicators and targets where appropriate.	**Section 3.4** presents the SEA Objectives and Guide Questions.
Links to other related plans, programmes and policies are identified and explained.	**Appendix A** identifies relevant plans, programmes and policies.
Scoping	
The environmental consultation bodies are consulted in appropriate ways and at appropriate times on the content and scope of the Scoping Report.	Two scoping consultations were conducted in 2010 and 2011 covering generic and site specific information. **Section 1.7.2** presents information on scoping consultation. **Box 1.1** sets out those statutory bodies consulted.
The SEA focuses on significant issues.	**Section 3.2** sets out the scope of the assessment. These issues reflect the views of the scoping consultees as detailed **in Section 1.7.2.** The significant issues are identified in Appendix A for each of the 14 topics and then are reflected in the objectives and guide questions used to undertake the assessment presented in **Section 3.4**.
Technical, procedural and other difficulties encountered are discussed; assumptions and uncertainties are made explicit.	These were stated throughout the scoping where appropriate, and are presented throughout this report.
Reasons are given for eliminating issues from further consideration.	No issues were eliminated from further consideration.
Alternatives	
Realistic alternatives are considered for key issues, and the reasons for choosing them are documented.	Alternatives were identified in **Section 2.2 and 2.3**.
Alternatives include 'do minimum' and/or 'business as usual' scenarios wherever relevant.	These were considered in **Section 2.4, 6.1.1 and 6.2**.
The environmental effects (both adverse and beneficial) of each alternative are identified and compared.	Refer to **Section 4, 5** and **6** and **Appendix A.**
Inconsistencies between the alternatives and other relevant plans, programmes or policies are identified and explained.	Refer to **Section 2.3**.
Reasons are given for selection or elimination of alternatives.	These are presented in **Sections 2.3, 2.4** and **6.1.1**.

Baseline Information	
Relevant aspects of the current state of the environment and their likely evolution without the plan are described.	Refer to **Appendix A** where baseline information is provided for each SEA topic considered.
Characteristics of areas likely to be significantly affected are described, including areas wider than the physical boundary of the plan area where it is likely to be affected by the plan where practical.	Refer to **Appendix A**
Difficulties such as deficiencies in information or methods are explained.	These are stated throughout the report where appropriate.
Prediction and Evaluation of Significant Environmental Effects	
Effects identified include the types listed in the Directive (biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage and landscape) as relevant; other likely environmental effects are also covered as appropriate.	These are set out in **Appendix A** and summarised in **Section 4, 5 and 6**.
Both positive and negative effects are considered, and the duration of effects (short, medium, or long tem) is addressed.	These are set out in **Appendix A** and summarised in **Section 4, 5 and 6**.
Likely secondary, cumulative and synergistic effects are identified where practicable.	Refer to **Appendix A, Section 5 and Section 6.8.**
Inter-relationships between effects are considered where practicable.	Refer to **Appendix A, Section 5 and Section 6.**
The prediction and evaluation of effects makes use of relevant accepted standards, regulations and thresholds.	Refer to individual topic chapters in **Appendix A** and **Section 3.5.1.**
Methods used to evaluate the effects are described.	These are described in **Section 3.5.1.**
Mitigation Measures	
Measures envisaged to prevent, reduce and offset any significant adverse effects of implementing the plan or programme are indicated.	These are set out in the assessments presented in **Appendix A** and in **Section 5, 6** and summarised in **Section 7.2.7.**
Issues to be taken into account in project consents are identified.	These are set out in the assessments presented in **Appendix A** and in **Section 4, 5** and summarised in **Section 7.2.7.**
Environmental Report	
Is clear and concise in its layout and presentation.	The layout of the Environmental Report is set out in **Section 1.5.** The structure was subject to early consultation and review as part of scoping.
Uses simple, clear language and avoids or explains technical terms.	The Environmental Report has been written in plain English as far as the technical nature of the report allows. The **Abbreviations and Glossary section** provides definitions and technical terms are explained where necessary.

Uses maps and other illustrations where appropriate.	Figures and tables have been used throughout the SEA Report and in **Appendix A** where appropriate.
Explains the methodology used.	This is presented in **Section 3**.
Explains who was consulted and what methods of consultation were used.	This is covered in **Section 1.7.2**.
Identifies sources of information, including expert judgement and matters of opinion.	References to information sources are provided throughout the report and **Appendix A** where appropriate.
Contains a non-technical summary covering the overall approach to the SEA, the objectives of the plan, the main options considered, and any changes to the plan resulting from the SEA.	An **NTS** is provided as a stand alone document.
Consultation	
The SEA is consulted on as an integral part of the plan-making process.	Consultation has already taken place on the Scoping Report in 2010 and 2011. Consultation on the Environmental Report will be undertaken alongside the draft SDP proposals for 4 months between October 2011 and February 2012.
Consultation Bodies and the public likely to be affected by, or having an interest in, the plan or programme are consulted in ways and at times which give them an early and effective opportunity within appropriate timeframes to express their opinions on the draft plan and Environmental Report.	Stakeholders have been engaged throughout the preparation of the Scoping Report and comments have been sought during designated consultation periods and workshops. Consultation on the Environmental Report will be undertaken alongside the draft SDP proposals for 4 months.
Decision-making and Information on the Decision	
The Environmental Report and the opinions of those consulted are taken into account in finalising and adopting the plan or programme.	This will be included in the Post Adoption Statement (to be issued following consultation).
An explanation is given of how they have been taken into account.	This will be included in the Post Adoption Statement (to be issued following consultation).
Reasons are given for choosing the plan or programme as adopted, in the light of other reasonable alternatives considered.	This will be included in the Post Adoption Statement (to be issued following consultation).
Monitoring Measures	
Measures proposed for monitoring are clear, practicable and linked to the indicators and objectives used in the SEA.	These are presented in **Section 7.3**.
Monitoring is used, where appropriate, during implementation of the plan or programme to make good deficiencies in baseline information in the SEA.	Details of this are provided in **Section 7.3**.
Monitoring enables unforeseen adverse effects to be identified at an early stage (these effects may include predictions which prove to be incorrect).	Details of this are provided in **Section 7.3**.
Proposals are made for action in response to significant adverse effects.	This will be set out in the Post Adoption Statement (to be published following consultation).

7.5 Next Steps

This Environmental Report forms part of the Public Consultation on the SDP, taking place from October 2011 to February 2012. This is a national consultation, with local events taking place around Rosyth and Devonport as well as nationally. MOD would like to hear your views on both the SDP proposals and the Environmental Report; *details of how to do this can be found overleaf*.

The SDP proposals and the Environmental Report will be reviewed in light of the views expressed during the consultation, and may then be updated or revised accordingly. Feedback received on the SEA will be documented in the SDP's Post-Consultation Report.

Once Ministerial decisions have been made about the way forward, a Post Adoption Statement will be completed, summarising how the SEA and the consultation responses have been taken into account and how environmental considerations have been integrated into the final SDP proposals.

Depending on the preferred option for ILW storage, further strategic assessment may then be needed.

After the strategic decisions have been made, the SDP will move into the detailed planning stage. In order to start work, the site licensee(s) will also have to apply for environmental permits from the relevant Statutory Regulators. All of these involve public consultation, and so will provide an opportunity for people to review the detailed plans and to provide their views on the site-specific environmental effects that are identified at that point.

This Consultation: How to Give us your Views.

We would welcome your views on this Environmental Report and the Non-Technical Summary, as part of the wider public consultation of the Submarine Dismantling Project. We are particularly interested to receive your views on the following questions:

1. **Do you think that the environmental report has captured the significant environmental effects of the SDP?** If not, what potential effects do you think we have missed, and why?
2. **Is there any other baseline of environmental information, relevant to the SEA, that we have not included?** If so, please provide details.
3. **Do you agree with the proposed arrangements for monitoring significant effects of the SDP options, detailed in the Environmental Report?** If not, what measures do you propose?
4. **Do you agree with the conclusions of the Report and the recommendations for avoiding, reducing or off-setting significant effects of the SDP options?** If not, what do you think should be the key recommendations and why?

These questions are included in the SDP consultation proposals, of which this environmental report is a part. Copies of both documents are available electronically from www.mod.uk/submarinedismantling

Please provide your comments by **February 17th 2012**. Comments should be sent to:

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All of the documents produced for this Consultation and further background information is available on the MOD website at: www.mod.uk/.submarinedismantling

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Abbreviations and Glossary

AAP	Area Action Plan
ALARP	As Low As Reasonably Practicable
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
BAP	Biodiversity Action Plan
BPEO	Best Practicable Environmental Option
CADMID	Concept, Assessment, Development, Manufacture, In-service, Disposal
CAMS	Catchment Abstraction Management Strategies
CCL	Climate Change Levy
CHP	Combined Heat and Power
CLG	Department for Communities and Local Government
DBERR	Department of Business, Enterprise and Regulatory Reform (formerly DTI)
DCCLP	Devonport landing Craft Co-Location Project
DCLG	Department for Communities and Local Government (formerly ODPM)
DDLP	De-Equip, De-fuel and Lay-Up Preparations
DECC	Department of Energy and Climate Change
DE&S	Defence Equipment and Support
Defra	Department for Environment, Farming and Rural Affairs
ISM	In-Service Submarines
DfT	Department for Transport
DIO	Defence Infrastructure Organisation
DNEB	Defence Nuclear Executive Board
DNSR	Defence Nuclear Safety Regulator
DoENI	Department of Environment Northern Ireland
DWS	Drinking Water Standards
DWSP	Drinking Water Safety Plans
EA	Environment Agency
EfW	Energy from Waste
EIA	Environmental Impact Assessment
ETS	Emission Trading Scheme
EU	European Union
GHG	Greenhouse Gas
HSE	Health and Safety Executive
HLW	Higher-Level Waste
IAG	Isolus Advisory Group (now the SDP Advisory Group)
IEEM	Institute of Ecology and Environmental Management
IPT	Integrated Project Team
KUR	Key User requirement
LDD	Local Development Document
LNR	Local Nature Reserve

LUSM	Laid-Up Submarine
MGBC	Main Gate Business Case
MISG	MOD Isolus Steering Group (now the SDP Steering Group)
MNR	Marine Nature Reserves
NBC	Naval Base Commander
NGO	Non-Governmental Organisation
NNR	National Nature Reserves
NPS	National Policy Statement
NVZ	Nitrate Vulnerable Zone
ODPM	Office of the Deputy Prime Minister (now CLG)
OGC	Office of Government Commerce
OGD	Other Government Departments
OJEU	Official Journal of European Union
ONR	Office of Nuclear Regulation (formerly the Nuclear Installations Inspectorate)
ONS	Office of National Statistics
OSPAR	Oslo-Paris Agreement on the Protection of the North-East Atlantic
PMP	Project Management Plan
PPG	Planning Policy Guidance
PPS	Planning Policy Statement
RIDDOR	Reporting of Incidents, Diseases and Dangerous Occurrences Regulations 1995
RN	Royal Navy
RSS	Regional Spatial Strategy
SAM	Scheduled Ancient Monument
SG	Scottish Government
SEPA	Scottish Environment Protection Agency
SOGE	Sustainable Operations on the Government Estate
SSSI	Site of Special Scientific Interest
ToR	Terms of Reference
TRIR	Total Recordable Injury Rate
UK	United Kingdom
UKCIP	UK Climate Impacts Programme
UNFCCC	United Nations Framework Convention on Climate Change
WCA	Wildlife and Countryside Act
WFD	Water Framework Directive

Glossary

Authorisation/ Authorised Site	Authorisations allow specific defence-related nuclear activity to take place. Such 'Authorised' sites are not subject to the Nuclear Installations Act (unlike civil nuclear sites) and so activities are not formally 'Licensed.' Instead, Authorisations are granted by the Defence Nuclear Safety Regulator, DNSR. However, the submarines will have to be dismantled on a Licensed site, regulated by the Office of Nuclear Regulation (part of the Health and Safety Executive).
'Brownfield' or previously-developed land	This term refers to land which is, or has, been previously been built upon or otherwise developed. Ideally, there should be sufficient existing infrastructure in place (such as a dock to accommodate the submarines), but there would be no nuclear facilities or specialist personnel available.
CIOP	**Consultation on ISOLUS Outline Proposals:** The second consultation on the project (then called ISOLUS) conducted in 2003.
Consultation Bodies	The UK Statutory Consultation bodies for SEA are: • The Environment Agency (England and Wales); Scottish Environment Protection Agency (SEPA); Northern Ireland Environment Agency; • English Heritage; Historic Scotland; Cadw (Welsh Government historic environment service); • Natural England; Scottish Natural Heritage; Countryside Council for Wales; • The Scottish Government and Welsh Government.
CoRWM	Committee on Radioactive Waste Management This independent committee provides scrutiny and advice to Government on the long term management of radioactive waste, including storage and disposal. See http://corwm.decc.gov.uk/ for more details.
Defuelling	The removal of spent (used) nuclear fuel from the submarines' reactor after it has left service. Submarines will have been defueled before they are dismantled.
FEC	Front End Consultation The first consultation on the project (then called ISOLUS) conducted in 2001.
GDF	Geological Disposal Facility The government's proposed long-term, below-ground facility for disposing of the UK's Higher-Activity Nuclear Waste (HLW and ILW). No site has yet been identified for the GDF. See http://mrws.decc.gov.uk/en/mrws/cms/home/What_is_geolog/What_is_geolog.aspx for more details.

'Greenfield' or undeveloped land	This term refers to land that has not previously been developed (such as farmland), or which has been used but has reverted back to a largely 'natural' state (such as disused quarries). On such land, there would be no existing infrastructure or other resources suitable to undertake submarine dismantling or store ILW, so most or all the required infrastructure would need to be developed from scratch.
HRA	Habitats Regulations Assessment This is a statutory assessment, required by the EC Habitats Directive (92/43/EEC) and transposing Regulations, which is carried out on any plan or project that has the potential to affect a European-designated wildlife site. Because Rosyth and Devonport are close to such designated sites, a plan-level HRA has been undertaken for the SDP. The draft HRA report can be found as part of the supporting information to the public consultation at www.mod.uk/submarinedismantling. Further project-level HRAs may need to be undertaken by the MOD or regulatory bodies to support decisions about particular SDP stages or developments.
ILW	Intermediate Level Waste This is radioactive waste with a radiological activity above 4 GigaBecquerels (GBq) per tonne of alpha, or 12 GBq/tonne of beta-gamma decay, but which does not generate enough heat to require it to be cooled during storage. By contrast, nuclear fuels are generally much more active, and have to be kept cool. The majority of ILW from submarines is metal in the RPV, with smaller quantities of organic materials, cement, graphite and ceramics.
Interim ILW Storage	ILW is stored for an 'interim' period until a disposal route is available. Interim stores are designed for 100 years to provide safe and secure protection for waste packages. There are currently more than twenty such sites in the UK. A robust programme of interim storage will play an integral part in implementing geological disposal.
Initial Dismantling	The process whereby radioactive waste is removed from the laid-up submarines. This work has to take place on a site with an appropriate nuclear site Licence, issued by the Office of Nuclear Regulation (part of the Health and Safety Executive). There are three options for initial dismantling in the SDP - namely RC separation and storage, RPV removal and storage, and RPV removal and size reduction to Packaged Waste (explanation of these options are provided in this glossary).
ISOLUS	Interim Storage of Laid-Up Submarines The former name of the Submarine Dismantling Project. It was changed to the Submarine Dismantling Project in 2009.

Licence/ Licensed Site	A Nuclear Licence allows specific nuclear activities to take place at a specific site. Such 'Licensed' sites are subject to the Nuclear Installations Act (1965), with Licenses being granted by the Office of Nuclear Regulation Nuclear power stations and other civil activities are Licensed in this way, and any submarine dismantling site will require a civil License
Likely Significant Effect	A positive or negative effect that could reasonably be expected, and that would have *a lasting and substantial change on the environment or community*, due to its size, duration and/or frequency, and the importance of the affected site, species or feature. Examples would include the creation of more than 100 permanent jobs, damage to an internationally important conservation site or building work that increases the risk of serious flooding. The full set of criteria to be considered when determining significance is set out in Schedule 2 of the SEA Regulations.
LLW	<u>Low Level Waste</u> This is defined as radioactive waste that has below 4 Gbq per tonne of alpha activity and below 12 GBq per tonne of beta-gamma activity. It covers a variety of materials which arise principally as lightly contaminated miscellaneous scrap and redundant equipment. LLW has an existing route to the UK LLW Repository in Cumbria.
MRWS	<u>Managing Radioactive Waste Safely</u> The UK Government's published approach to managing the nation's radioactive wastes, irrespective of where they come from and their level of activity. The SDP will adhere to this approach. See http://mrws.decc.gov.uk/ for more details.
Minor Effect	The aim of SEA is to assess the *likely significant effects* of the plan or programme. The definition of a 'likely significant effect' is given above. By definition, a minor effect on the environment is one which is not severe enough to conform with this definition. Examples would include the creation of a few tens of permanent jobs, short-term and reversible effects on air or water quality, or disturbance to people or wildlife that would certainly be felt, but not cause permanent damage.
NDA	<u>Nuclear Decommissioning Authority</u> The Government agency responsible for delivering the safe and cost effective decommissioning the UK's publicly owned civil nuclear facilities and developing the UK's nuclear low level waste strategy and plans, and for managing the long-term arrangements for the UK's higher level radioactive wastes including spent nuclear fuels and ILW. The NDA manages the MOD's spent nuclear fuel on behalf of the government. See http://www.nda.gov.uk/ for more details.

PW	<u>Packaged Waste</u> The option for removing the radioactive materials from the submarines, whereby the Reactor Pressure Vessel is removed from the submarine, cut apart and cemented into approved containers for transport, interim storage and disposal in the proposed GDF. The project is working on the basis of using containers with an internal capacity of 3 cubic metres (known as ‘$3m^3$ boxes’).
Packaged Waste Storage	This term refers to storing the $3m^3$ boxes of ILW until the proposed GDF can accept it, some time after 2040.
Ramsar Site	A wetland of international importance, designated under the Ramsar Convention. In the United Kingdom, Ramsar Sites are protected in the same way as European sites (e.g. SPAs and SACs).
RC	<u>Reactor Compartment</u> This is the central 'slice' of the submarine which contains the nuclear reactor (housed in the Reactor Pressure Vessel) and the primary circuit, which transfers heat to the boiler. Reactor Compartments typically weigh around 700 tonnes (1,000 tonnes for ‘Vanguard’ Class submarines), are approximately 10 metres in diameter, and are around nine metres long (depending on submarine type).
RC Storage	The option for removing the radioactive materials from the submarines, whereby the complete Reactor Compartment is separated from the rest of the submarine, sealed shut, and stored intact. This is the current approach used by the USA, France and Russia. RCs will be too large to fit into the proposed GDF intact. This means that each RC will eventually have to be dismantled further in to GDF-compliant containers before it can be disposed of.
RPV	<u>Reactor Pressure Vessel</u> The self-contained metal container inside the Reactor Compartment which, prior to defuelling, contains the nuclear fuel. RPVs are between approximately 50 and 80 tonnes in weight, are approximately 2.5-3 metres in diameter, and are around 5 metres long, including the RPV head (depending on submarine type).
RPV Storage	The option for removing the radioactive materials from the submarines, whereby the whole Reactor Pressure Vessel is removed from the submarine and stored intact. According to current plans, RPVs may be too large to fit into the proposed GDF intact, although we are exploring the opportunities to dispose of whole RPVs. If this is not possible, each RPV would eventually have to be cut apart (‘size reduced’) into packaged waste before it is disposed of.
SAC	Special Area of Conservation This is an area that has been been given special protection under the European Union’s Habitats Directive (92/43/EEC). SACs form part of the ‘Natura 2000’ network of protected wildlife areas across the EU.

SDP	Submarine Dismantling Project: www.submarinedismantling.co.uk
Ship Recycling	This is the process whereby the hull of the submarine (which forms the bulk of each vessel) are dismantled once the radioactive materials have been removed and they have been cleared for release by the Regulator. This does not have to be undertaken at the initial dismantling site, so could take place elsewhere in the UK. The issues associated with recycling the residual submarines are very similar to those for scrapping surface ships.
SEA	Strategic Environmental Assessment This is the type of Statutory assessment undertaken on certain public plans and programmes, to assess the potential environmental effects that they may have, and to identify ways to avoid or minimise damaging impacts and enhance positive ones. SEA gives the public the opportunity to see what those impacts might mean for them and comment on them, so that they can help shape the approach taken. SEA comes from the EU SEA Directive (2001/42/EC) and is enacted in the UK through the Environmental Assessment of Plans and Programmes Regulations 2004 (SI 2004 No. 1633).
Size reduction	The term used by the nuclear industry to refer to the process of cutting-up radioactive waste into smaller pieces so that it can be packaged into containers. Size reduction is an established process in the civil nuclear industry.
SPA	Special Protection Area This is an area that has been been given special protection under the European Union's Birds Directive (/409/EEC). SPAs form part of the 'Natura 2000' network of protected wildlife areas across the EU.
vLLW	Very Low Level Waste This is radioactive waste with very low levels of radioactivity, which can generally be disposed of in conventional waste streams.

SUBMARINE DISMANTLING PROJECT

Environmental Report

Appendix A Part I

(Topics A1 to A7)

October 2011

de&s SUBMARINES

Defence Infrastructure Organisation

This Appendix A contains information on the following topics:

- Biodiversity and nature conservation;
- Population;
- Health;
- Noise;
- Soil and Geology;
- Water;
- Air.

Each topic section contains:

- introduction - provides an overview and definition of the topic;
- summary of national and subregional plans and programmes - provides an overview of the policy context in which the SDP sits;
- overview of the national and sub-regional baseline - provides an overview of the baseline and the key topic specific baseline factors which will need to be considered as part of the assessment;
- existing problems - highlights some of the existing pressures on the topic area, particularly in relation to the SDP;
- likely evolution of the baseline - provides an overview of how the baseline is likely to change in the absence of the SDP, an understanding of this is key to understanding the effects of the SDP on the topic area;
- assessment objective and guide questions together with guidance as to how the significance of potential effects has been determined;
- generic assessment - including information on the potential nature and scale of effects, proposed mitigation measures (where appropriate) and measures for enhancement, assumptions and uncertainties and additional information that may be require;
- integrated options assessment - including information on the potential nature and scale of effects, proposed mitigation measures (where appropriate) and measures for enhancement, assumptions and uncertainties and additional information that may be require.

A1. Biodiversity and Nature Conservation

1.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. A range of siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on biodiversity and nature conservation. Information is presented for both national and sub-regional levels.

Biodiversity in this context is defined by the ***Convention on Biological Diversity***[1] as 'the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.'

There are links between the biodiversity and nature conservation topic and other topics in the SEA, including water, soil and geology, land use, and climate change.

1.2 Summary of Plans and Programmes

1.2.1 International

There are a number of EU Directives focusing on various types of wildlife and habitat that provide a framework for national action and international co-operation for conservation on land and in the sea. In particular the ***Habitats Directive*** and ***Birds Directive*** include measures to maintain or restore important natural habitats and species including through the designation of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). These Directives are transposed into British law through a number of regulations and planning policy documents. Under the ***Ramsar Convention***, wetlands of international importance are designated as Ramsar Sites. As a matter of policy, Ramsar sites in England are protected as European sites. The vast majority are also classified as SPAs and all terrestrial Ramsar sites in England are notified as Sites of Special Scientific Interest (SSSIs). The ***Freshwater Fish Directive*** includes measure on the quality of fresh waters needing protection or improvement in order to support fish life.

The ***Marine Strategy Framework Directive (2008/56/EC)*** requires Member States to develop a marine

[1] The convention uses this definition to describe 'biological diversity' commonly taken to mean the same as biodiversity.

strategy, including determining Good Environmental Status (GES) for their marine waters, and designing and implementing programmes of measures aimed at achieving it by 2020, using an ecosystem approach to marine management. It takes account both of socioeconomic factors and the cost of taking action in relation to the scale of the risk to the marine environment. Draft regulations establish a legal framework which assigns duties to the Secretary of State, Welsh and Scottish Ministers and the Department of the Environment in Northern Ireland have been published for consultation.

1.2.2 National

UK

The Wildlife and Countryside Act (1981) is the main UK legislation relating to the protection of named animal and plant species includes legislation relating to the UK network of nationally protected wildlife areas: SSSIs[2]. The ***UK Biodiversity Action Plan (1994)*** was established to conserve and enhance biodiversity in the UK through the use of Habitats and Species Action Plans to help the most threatened species and habitats to recover and to contribute to the conservation of global biodiversity.

Conserving Biodiversity – The UK Approach (2007) sets out an approach to halt UK biodiversity loss by 2010 using an integrated framework of an Ecosystem Approach[3]. More recently the ***Conservation of Habitats and Species Regulations (2010)*** requires that sites of importance to habitats or species are to be designated and any impact on such sites or species must be considered in regards to planning permission applications.

The ***Environmental Protection Act (1990)*** sets out key statutory requirements for the UK regarding environmental protection (including waste and nature conservation).

The ***Marine and Coastal Access Act (2009)*** sets out a number of measures including the establishment of Marine Conservation Zones (MCZs) and Marine Spatial Plans. The ***Offshore Marine Conservation (Natural Habitats, &c.) Regulations (2007)*** apply in the 'offshore area' beyond 12 nautical miles from the UK coast. They provide protection for a variety of marine species and wild birds through a number of offences that aim to prevent damaging activities affecting protected species and habitats.

The ***National Parks and Access to the Countryside Act (1949)*** aims to conserve and protect countryside and National Parks through legislation.

The ***Offshore Marine Conservation (Natural Habitats, &c.) Regulations (2007)*** apply in the 'offshore

[2] As amended by the *Countryside and Rights of Way (CROW) Act 2000* and the *Natural Environment and Rural Communities (NERC) Act 2006*
[3] The Convention on Biological Diversity (http://www.cbd.int/ecosystem/) defines the Ecosystem Approach as *'a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.'*

area' beyond 12 nautical miles from the UK coast. They provide protection for a variety of marine species and wild birds through a number of offences that aim to prevent damaging activities affecting protected species and habitats.

England

Working with the grain of nature: a biodiversity strategy for England (2002) aims to conserve and enhance priority habitats and species and to see the conservation of biodiversity considered in all relevant public, private and non-governmental decisions and policies.

Planning Policy Statement 9 (PPS9): Biodiversity and Geological Conservation sets out national guidance on how government policies for the conservation and enhancement of England's biodiversity should be reflected in land use planning, supported by ***Circular 06/05: Biodiversity and Geological Conservation***, which provides guidance on the application of the law relating to planning and nature conservation as it applies in England.

The Natural Environment and Rural Communities (NERC) Act (2006) establishes Natural England as the main body responsible for conserving, enhancing and managing England's natural environment. It also covers biodiversity, pesticides harmful to wildlife and the protection of birds.

Scotland

Nature Conservation Act (Scotland) (2004) places duties on public bodies in relation to the conservation of biodiversity, increases protection for SSSI, amends legislation on Nature Conservation Orders, provides for Land Management Orders for SSSIs and associated land, strengthens wildlife enforcement legislation, and requires the preparation of a Scottish Fossil Code.

Scottish Planning Policy (SPP) (2010) sets out the Scottish Government's policy on land use planning incorporating the conservation of designated or protected sites and species taking into account the ecosystems and natural processes and seeks to establish integrated habitat networks.

Planning Advice Note 60 (PAN 60): Planning for Natural Heritage (2000) provides advice on how development and the planning system can contribute to the conservation, enhancement, enjoyment and understanding of Scotland's natural environment and encourages developers and planning authorities to be positive and creative in addressing natural heritage issues.

Scotland's Biodiversity: It's in Your Hands – A strategy for the conservation and enhancement of biodiversity in Scotland aims to conserve biodiversity for the health, enjoyment and wellbeing of the people of Scotland now and in the future and provides a 25 year framework in order to achieve this goal.

Wales

Planning Policy Wales (Edition 3) (2010) sets out the land use planning policies of the Welsh Assembly Government, including objectives for the conservation and improvement of landscape and biodiversity.

Technical Advice Note 5 (TAN5): Nature Conservation and Planning (2009) sets out how the planning system should contribute to protecting and enhancing biodiversity and geological conservation.

Wales Environment Strategy Action Plan 2008 – 2011 is the second of its type and it facilitates a more strategic approach to environmental improvement and includes actions under the heading biodiversity.

Northern Ireland

The ***Northern Ireland Biodiversity Strategy (2002)*** and ***An Integrated Coastal Zone Management Strategy for Northern Ireland 2006-2026 (2006)*** provide strategies for safeguarding biodiversity, including targets, implementation plans and recommendations for Habitat Action Plans (HAPs) and Species Action Plans (SAPs). More recently, Northern Ireland Executive has published the Everyone's involved Sustainable Development Strategy (2010) which includes the action to halt biodiversity loss.

The ***Programme for Government (2007)*** completed by the Office of the First Minister and Deputy First Minister seeks to protect the natural environment by increasing the area of forest and woodland by 1650 by 2011 and halting the loss of indigenous species and habitats by 2016.

The strategic objective of the ***Planning Strategy for Rural Northern Ireland (1993)*** is to protect and enhance the natural and man-made environment. This is gradually being replaced by ***Planning Policy Statements*** such as ***PPS1*** and ***PPS2***, which set out the government's policies for the conservation of natural heritage.

1.2.3 Sub-regional locations

Plymouth

Habitat and species conservation priorities are set in ***Devon's Biodiversity Action Plan (BAP) (1998, revised 2005).*** The BAP is the agreed source of habitat and species conservation priorities. Some of the key habitats relevant to the maritime environment are estuaries, rocky foreshore, rocky seabed, otter and Atlantic salmon.

Plymouth City Council's Core Strategy Development Plan Document (2007) includes an overarching policy ***(Policy CS19: Wildlife)*** for the protection of biodiversity in Plymouth. Policy CS19 seeks to safeguard national and international protected sites for nature conservation from inappropriate development; ensure appropriate consideration is given to European and nationally protected and important species; maintain a citywide network of local wildlife sites and wildlife corridors; ensure that development retains, protects and enhances features of biological or geological interest, and provides for the appropriate management of these features; ensure development seeks to produce a net gain in biodiversity by designing in wildlife, and ensuring any unavoidable impacts are appropriately mitigated for; and supporting wildlife enhancements which contribute to the habitat restoration targets set out in the South West Nature Map and in National, Regional and Local Biodiversity Action Plans.

Fife

Fife's Local Biodiversity Action Plan (2009-2011) sets out priority habitats and species with the intent of preserving the biodiversity of the region. Objectives are listed for each priority habitat and species.

Within ***Fife's Structure Plan (2006-2026)*** are three policies relevant to nature conservation;

- ***Policy ENV2*** focusing on international sites;
- ***Policy ENV3*** focusing on national sites; and
- ***Policy ENV4*** focusing on enhancement of nature conservation.

1.3 Overview of the Baseline

1.3.1 National

UK

Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites are important for biodiversity at the international level. In the UK, there are 614 SACs (covering 2,813,359 hectares), 268 sites (covering a total of 2,745,677 hectares) and 146 Ramsar sites (covering 782,727 hectares).[4]

In addition, there are also over 6,550 nationally designated sites in the UK, known as SSSIs in England, Wales and Scotland, and Areas of Special Scientific Interest (ASSIs) in Northern Ireland.

There are 182 protected areas in UK inshore waters with a marine element, which includes 81 SPAs with marine habitats for birds, 98 SACs with marine habitats or species and three Marine Nature Reserves.

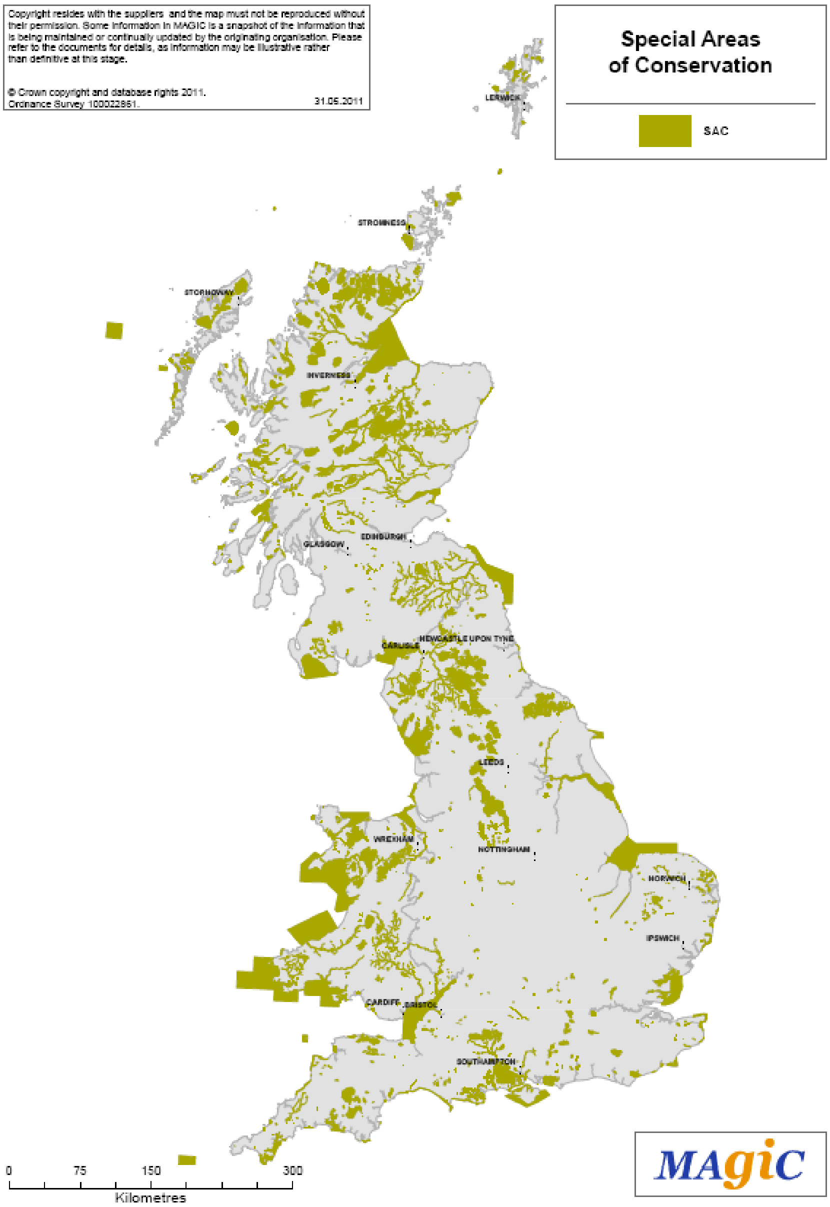
[4] JNCC, Protected sites http://jncc.defra.gov.uk/page-1456 (accessed 17.06.2011)

In total, the area coverage of these sites exceeds 1.8 million hectares, or 2.2% of UK waters.[5]

A review of the UK BAP priority list in 2007 led to the identification of 1,150 species and 65 habitats that meet the BAP criteria at UK level.[6]

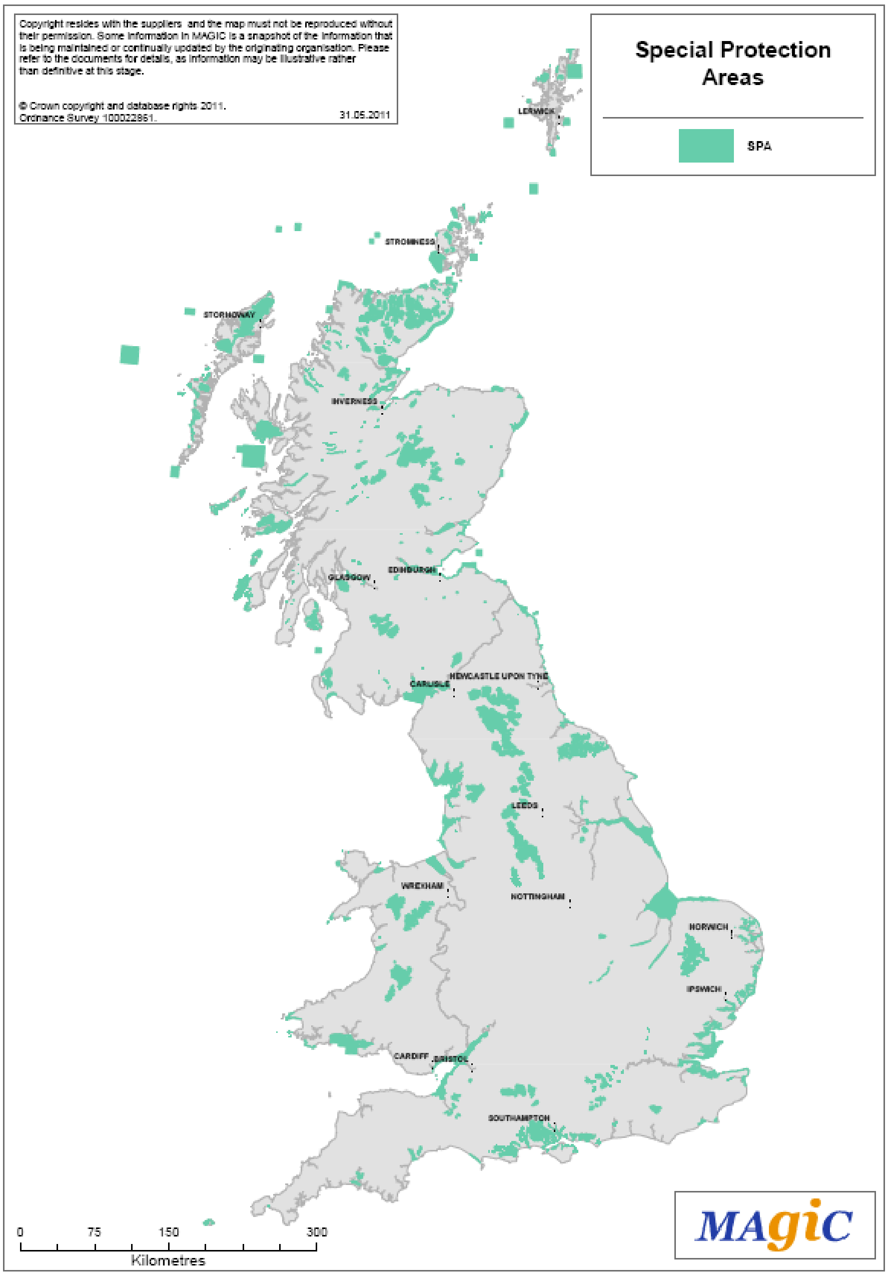
[5] Defra http://www.defra.gov.uk/foodfarm/fisheries/documents/mpp2009-10info.pdf (accessed 04/10/2010)
[6] Natural England http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/ukactionplan.aspx

Figure 1.1 Location of Special Areas of Conservation (SACs) in the UK[7]



[7] http://magic.defra.gov.uk/staticmaps/maps/sac_gb_col.pdf

Figure 1.2 Location of Special Protected Areas (SPAs) in the UK[8]



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[8] http://magic.defra.gov.uk/staticmaps/maps/spa_gb_col.pdf

Figure 1.3 Location of RAMSAR sites in the UK[9]

The Ministry of Defence (MOD) rural and urban estate supports 37 UK Biodiversity Action Plan (UK

[9] http://magic.defra.gov.uk/staticmaps/maps/ramsar_gb_col.pdf

BAP) priority habitats and 139 UK BAP priority species.[10] In March 2009, the MOD had management responsibility for 172 SSSIs and ASSIs, of which over 110 of these sites also have International and European nature conservation designations.[11]

In March 2009 the following percentages of MOD managed SSSIs were in target condition: 91.5% in England (against a Government target of 95% by 2010), 68% in Scotland (target 95% by 2010), 78% in Wales (target 85% by 2013) and 57% in Northern Ireland (target 95% by 2013).[10, 11]

England

There are over 4,100 SSSIs in England, covering 1,076,986ha (including open water and coastal habitats). In terms of land area, approximately 8% of England is designated as SSSI.[12]

In England there are 251 SACs, 85 SPAs and 73 RAMSAR sites.[13]

As at 1 January 2008 the overall condition of habitats in SSSIs has been assessed as 80% favourable or recovering. SSSI condition varies between habitats. The only habitats with less than 50% in favourable or recovering condition are rivers and streams, and canals. The habitats with the greatest area in unfavourable condition are bogs, heathlands, and intertidal mudflats and saltmarsh.[14]

Scotland

In Scotland there are 239 SACs covering 8.2% of the total land area of Scotland, 147 SPAs covering 8.2% of Scotland, and 51 Ramsar sites covering 3.9% of Scotland. Scotland has over 1,450 SSSIs covering 13% of the total land area in Scotland. [15]

In 2005, 55% of SSSI habitats were in favourable condition, 99% of marine features were favourable, 45% of habitats were unfavourable, unfavourable declining or destroyed. The greatest proportion of unfavourable features was among lowland heath and wetland (81% and 71% unfavourable,

[10] MOD, Sustainable Development Report and Action Plan, 2008, http://www.mod.uk/NR/rdonlyres/D8407A1C-CA68-4AD4-8E17-9F71B151AF6A/0/SusDevReport2008.pdf. And MOD, Stewardship Report on the Defence Estates, 2007-08, http://www.defence-estates.mod.uk/estate/estatestrategy.php

[11] MOD, Stewardship Report on the Defence Estates, 2008/09, http://www.mod.uk/NR/rdonlyres/F9E34976-9E39-4E0D-BADA-157975DF2118/0/stewardshiprpt200809v7.pdf

[12] Natural England http://www.naturalengland.org.uk/ourwork/conservation/designatedareas/sssi/default.aspx

[13] JNCC Protected sites http://jncc.defra.gov.uk/page-1456

[14] State of the Natural Environment Report' (2008) http://naturalengland.etraderstores.com/NaturalEnglandShop/product.aspx?ProductID=31a51089-6654-4d48-8f89-30d3c8c66aee

[15] SNH Summary of natural heritage designations http://www.snh.gov.uk/publications-data-and-research/environmental-data/facts-and-figures/protected-areas/ (accessed 05/10/2010)

respectively).[16]

Wales

In Wales there are 92 SACs, 20 SPAs and 10 Ramsar sites.[17] Wales has over 1,000 SSSIs.

During the period 2000-2009 Natura 2000 sites (namely SAC and SPA sites) were in the following condition;[18]

- 60% were unfavourable;
- 15% were recovering; and
- 25% were favourable.

Northern Ireland

In Northern Ireland in March 2009 a total of 66,400 hectares had been declared as SACs, 114,600 hectares as SPAs, 77,700 hectares as Ramsar sites and 99,300 hectares as ASSIs. There is some overlap of area between these different types of designation and therefore, these cannot be totalled to give an absolute figure on the extent of designations.[19]

1.3.2 Sub-regional locations

Plymouth

The South West is one of the most bio-diverse regions in England and has the largest area of semi-natural habitat of any English region. This richness is reflected by the fact that almost 10% of the region by area has been designated as nationally or internationally important sites for wildlife.

There is one SAC in Plymouth, Plymouth Sound and Estuaries, which covers 6,402.3ha[20].

Plymouth Sound and Estuaries SAC is predominantly in favourable condition. Areas of minor degradation are in the Tamar-Tavey Estuary SSSI and Wembury Point SSSI. However, the Rame Head and Whitsand Bay SSSI has only 31.67% in favourable condition (although the rest is recovering).

Two other SACs (Dartmoor and South Dartmoor Woods) are nearby. Plymouth also has one SPA, the

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[16] Scottish Government (2007) Scotland's Biodiversity Indicators http://www.scotland.gov.uk/Publications/2007/10/08091435/13

[17] JNCC (2009) Spatial/summary data http://www.jncc.gov.uk/page-4 (accessed June 2010) and WAG (2009) Wales Spatial Plan Update Sustainability Appraisal and Strategic Environmental Assessment Environmental Report Appendix Volume 3 – Topic Papers

[18] Stats Wales (2010) State of the Environment http://www.statswales.wales.gov.uk/TableViewer/document.aspx?ReportId=5754

[19] Department of the Environment (2010) Northern Ireland Environmental Statistics Report

[20] Tamar Estuaries Consultative Forum, Plymouth Sound and Estuaries Coastal Planning Study, Final Report 7 September 2006 http://www.plymouth.gov.uk/coastal_planning_project_report.pdf

Tamar Estuaries Complex, which covers 1,955ha[21]. Within Plymouth there are three terrestrial SSSIs: Billacombe SSSI, Plymbridge Lane & Estover Road SSSI; and Tamar-Tavy Estuary SSSI.[22] In addition, Plymouth has eight designated Local Nature Reserves mostly situated on the eastern side of the city[22], and 23 County Wildlife Sites.[23]

Marine Conservation Zones (MCZ) are a new designation introduced by the Marine and Coastal Access Act. Lundy is currently the only MCZ in the south-west (it became an MCZ through a special provision in the Marine and Coastal Access Act). The four-year Finding Sanctuary project aims to design a network of marine protected areas (including MCZs) for the coasts and seas of South West England and preliminary work has highlighted the value of Plymouth Sound and waters immediately offshore. There is also one voluntary Marine Protected Area at Wembury.[24]

The complex ria system and wide rocky inlet of Plymouth Sound are popular with visitors, close to a large population, and accommodate military and commercial shipping. Potential threats therefore include: increased pressure for recreational moorings and associated facilities; port development and ongoing maintenance dredging. Both the geology and geography of Plymouth Sound make it very sensitive to oil pollution.[25]

Fife

In Fife there are three SACs, (Turflundie Wood, Firth of Tay & Eden Estuary and Isle of May), three SPAs (Cameron Reservoir, Firth of Forth, Firth of Tay & Eden Estuary), and two RAMSAR sites (Firth of Forth, Firth of Tay & Eden Estuary).[26]

Firth of Forth is in favourable condition, although two breeding bird populations are in decline (Kittiwake and Shag).

There are 48 SSSIs in Fife (covering around 7,715ha, approximately 5.62% of Fife), and seven Local Nature Reserves (covering 1,650ha).[27]

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[21] Plymouth City Council, Characteristics of the City of Plymouth, http://www.plymouth.gov.uk/homepage/environmentandplanning/natureconservation/protectingnature/designatedconservationareas.htm
[22] Plymouth City Council, Ecological Sites of Special Scientific Interest, http://www.plymouth.gov.uk/homepage/environmentandplanning/natureconservation/greenspace/greenspacesssi.htm
[23] Plymouth City Council County Wildlife Sites, http://www.plymouth.gov.uk/homepage/environmentandplanning/natureconservation/greenspace/countywildlifesites.htm
[24] Finding Sanctuary, http://www.finding-sanctuary.org/page/the-marine-environment.html
[25] Joint Nature Conservation Committee Plymouth Sound and Estuaries, http://www.jncc.gov.uk/ProtectedSites/SACselection/sac.asp?EUcode=UK0013111
[26] JNCC http://jncc.defra.gov.uk/page-1458 (accessed 16/06/2011)
[27] Scottish Natural Heritage, Number and Areas of Protected Sites by Local Authority, July 2009, http://gateway.snh.gov.uk/discoverer/

1.4 Existing problems

1.4.1 National

UK

An analysis of the causes of unfavourable condition and threats to the range of habitats by Natural England has revealed the key pressures and risks to be:

- habitat destruction and fragmentation by development;
- agricultural intensification and changes in agricultural management practices;
- changes in woodland and forestry management;
- water abstraction, drainage or inappropriate river management;
- inappropriate coastal management;
- lack of appropriate habitat management;
- atmospheric pollution (acid precipitation, nitrogen deposition);
- water pollution from both point and wider (diffuse) agricultural sources;
- climate change and sea level rise;
- sea fisheries practices;
- recreational pressure and human disturbance; and
- invasive and non-native species.[28]

[28] State of the Natural Environment Report' (2008) http://naturalengland.etraderstores.com/NaturalEnglandShop/product.aspx?ProductID=31a51089-6654-4d48-8f89-30d3c8c66aee

The same threats occur across the devolved administration in the UK. For example, the Scottish Biodiversity Group's report, Action for Scotland's Biodiversity (2000) identified seven key issues for biodiversity in Scotland: farming, forestry and fisheries as the main three, along with land development, air quality, water quality and transport.[29]

1.4.2 Sub-regional locations

Plymouth

In Plymouth, increased coastal development and marine activity leading to pollution and disturbance pose the greatest threats to the Plymouth Sound and Estuaries SAC and Tamar Estuaries Complex SPA.

The complex ria system and wide rocky inlet of Plymouth Sound are popular with visitors, close to a large population, and accommodate military and commercial shipping. Potential threats therefore include: increased pressure for recreational moorings and associated facilities; port development and ongoing maintenance dredging. Both the geology and geography of Plymouth Sound make it very sensitive to oil pollution.[30]

Potential risks to the Tamar Estuaries Complex SPA are development resulting in intertidal habitat damage; pollutant leakage; and dredging.

Both the geology and geography of Plymouth Sound make it very sensitive to oil pollution. Potential risks to the SAC are further port development; recreational mooring; ongoing maintenance dredging; and pollutant leakage.

Fife

The environmental problems and threats affecting biodiversity in Fife include fragmentation of habitats due to development pressures; non native invasive species; climate change impacts; agricultural practices; and land and freshwater pollution (including nutrient enrichment)[31]. Fife's wetlands, in particular, which are important for migrating wildfowl, appear to be declining due to changes in habitat distribution and land use.

Potential risks to SPA's in Fife are from visitors, localised tipping, pollutant leakage from the mainland or

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[29] SEPA (2007) State of Scotland's Environment 2006
[30] Joint Nature Conservation Committee, Plymouth Sound and Estuaries, http://www.jncc.gov.uk/ProtectedSites/SACselection/sac.asp?EUcode=UK0013111
[31] Fife Council (2007) State of the Environment Report

shipping affecting the surrounding waters, and sea level rise.

1.5 Likely evolution of the baseline

1.5.1 National

UK

The general global trend in biodiversity is generally towards a decreased level of variability among living organisms. The European Commission indicate that "Biodiversity loss has accelerated to an unprecedented level, both in Europe and worldwide. It has been estimated that the current global extinction rate is 1,000 to 10,000 times higher than the natural background extinction rate. In Europe some 42% of European mammals are endangered, together with 15% of birds and 45% of butterflies and reptiles".[32]

The global trend towards a decline in biodiversity is mirrored in the UK. In the UK, 30% of current biodiversity indicators are showing long term deterioration with 27% showing improvement. Areas of concern are: farmland, woodland and wetland birds; butterflies; bats; and marine ecosystem integrity.[33]

Results of the 2008 reporting round of the UK Biodiversity Action Plan indicate the following trends for habitats in the UK;[34]

- 16% of priority habitats were increasing (compared to 20% in 2005);
- 9% of priority habitats were stable (compared to 13% in 2005);
- 13% of habitats were declining (continuing/accelerating) (compared to 7% in 2005);
- 20% of habitats were declining (slowing) (compared to 24% in 2005);
- 24% of habitats were fluctuating (compared to 9% in 2005);
- 9% of habitats showed no clear trend (compared to 2% in 2005); and
- The status of 9% of habitats was unknown (compared to 24% in 2005).

The same report also found the following trends for UK species;[34]

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[32] European Commission, http://ec.europa.eu/environment/nature/biodiversity/intro/index_en.htm

[33] UK Biodiversity Indicators in Your Pocket 2010, http://www.jncc.gov.uk/pdf/BIYP_2010.pdf

[34] Biodiversity Action Reporting System, http://www.ukbap-reporting.org.uk/status/uk.asp

- 7% of species were increasing (compared to 8% in 2005);
- 23% of species were stable (compared to 25% in 2005);
- 22% of species were fluctuating (compared to 14% in 2005);
- 10% of species were declining (slowing) (compared to 9% in 2005);
- 7% of species were declining (continuing/accelerating) (compared to 10% in 2005);
- 2% of species were lost (pre BAP publication) (no change since 2005);
- 6% of species showed no clear trend (compared to 9% in 2005); and
- The status of 20% of species was unknown (compared to 22% in 2005).

In the UK, there has been an increase in the number of sites and areas protected for biodiversity, flora and fauna. Between 1996 and 2008 there has been a steady increase in total SPA and SAC area. Similarly, the total extent of land and sea protected in the UK has increased from 2.3 million to 3.8 million hectares between1996 and 2009. [35] It is hoped that the creation of a network of MCZs under the Marine and Coastal Access Act, which will create a new network of protected marine sites, should lead to an improvement in the biodiversity value of marine habitats. Coastal defence authorities have a specific target to ensure no net loss of habitats covered by Biodiversity Action Plans.

Key Government biodiversity targets include; [36] [37]

- For 95% of SSSIs to be in favourable or recovering condition by 2010;
- To halt the loss of biodiversity by 2010; and
- to reverse the long-term decline in the number of farmland birds by 2020.

England

Results of the 2008 reporting round of the UK Biodiversity Action Plan indicate that in England:[7]

Habitats:

- 17% of priority habitats were increasing (compared to 24% in 2005);

[35] Joint Nature Conservation Committee, Protected Areas, http://www.jncc.gov.uk/page-4241)
[36] Defra (2007) Conserving Biodiversity: the UK Approach www.defra.gov.**uk**/publications/files/pb12772-conbiouk-071004.pdf
[37] Defra (2002) Working with the Grain of Nature http://www.defra.gov.uk/publications/files/pb7718-biostrategy-021016.pdf

- 12% of priority habitats were stable (compared to 12% in 2005);
- 12% of habitats were declining (continuing/accelerating) (compared to 2% in 2005);
- 24% of habitats were declining (slowing) (compared to 34% in 2005);
- 24% of habitats were fluctuating (compared to 7% in 2005); and
- The status of 10% of habitats was unknown (compared to 20% in 2005).

Species:

- 8% of species were increasing (no change since 2005);
- 22% of species were stable (no change since 2005);
- 24% of species were fluctuating (compared to 19% in 2005);
- 6% of species were declining (slowing) (compared to 8% in 2005);
- 8% of species were declining (continuing/accelerating) (compared to 10% in 2005);
- 3% of species were lost (pre BAP publication) (no change since 2005);
- 5% of species showed no clear trend (compared to 7% in 2005); and
- The status of 21% of species was unknown (no change since 2005).

In England, in 2009 over 80% of SACs and SPAs were in favourable or recovering condition. SSSI condition in England has experienced a dramatic improvement in the overall site condition over the last 10 years as a result of protection and management[38]. However, some species in particular continue to be impacted upon. The trend in populations of breeding wading birds on unprotected lowland wetland grasslands is towards a major decline.[39]

Despite the increase in area protected for its biodiversity there is concern that the protected site network as it exists is insufficient to protect biodiversity in England as a whole and that some species and habitats will be confined to these protected areas and more vulnerable to pressures and threats, including climate change.[40]

[38] Natural England (2008) State of the Environment Report
[39] Joint Nature Conservation Committee, Protected Areas, http://www.jncc.gov.uk/page-4241)
[40] Lawton *et al* (2010) Making Space for Nature: A review of England's Wildlife Sites and Ecological Network

Scotland

In Scotland, in 2008 over 60% of SACs and over 70% of SPAs were in favourable or recovering condition.[41]

Results of the 2008 reporting round of the UK Biodiversity Action Plan indicate that in Scotland[42]:

Habitats:

- 13% of priority habitats were increasing (compared to 15% in 2005);
- 21% of priority habitats were stable (compared to 20% in 2005);
- 3% of habitats were declining (continuing/accelerating) (compared to 0% in 2005);
- 26% of habitats were declining (slowing) (compared to 29% in 2005);
- 16% of habitats were fluctuating (compared to 2% in 2005);
- 3% of habitats showed no clear trend (compared to 7% in 2005); and
- The status of 21% of habitats was unknown (compared to 27% in 2005).

Species:

- 4% of species were increasing (compared to 5% in 2005);
- 23% of species were stable (compared to 24% in 2005);
- 15% of species were fluctuating (compared to 3% in 2005);
- 11% of species were declining (slowing) (compared to 9% in 2005);
- 7% of species were declining (continuing/accelerating) (compared to 5% in 2005);
- 1% of species were lost (pre BAP publication) (no change since 2005);
- 7% of species showed no clear trend (compared to 8% in 2005); and
- The status of 32% of species was unknown (compared to 42% in 2005).

[41] Joint Nature Conservation Committee, Protected Areas, http://www.jncc.gov.uk/page-4241)
[42] Biodiversity Action Reporting System, http://www.ukbap-reporting.org.uk/status/uk.asp

Scotland's 2010 biodiversity targets underpin the high level target to halt the loss of biodiversity by 2010. Based on the European Biodiversity Action Plan framework and adopted by the Scottish Biodiversity Committee in March 2008, eight priority objectives, four supporting measures and 37 targets for action have been specified for Scotland. By the end of 2009 54% of these actions were on target (e.g. - principal pollutant pressures on terrestrial and freshwater biodiversity substantially reduced by 2010'), 27% had room for improvement (e.g. – climate change adaptation and mitigation measures) and 16% were not on target (e.g. – reducing the impact of invasive non-native species). [43]

Wales

A 2006 review[44] of SSSIs in Wales found that:

- 12% of Wales is designated as SSSI;
- during 2005/6 Wales gained three SSSIs, an additional 399 ha;
- 71% of SSSIs by area are also sites of international importance for wildlife;
- one quarter of SSSIs can be reached within 1km of a town or city;
- 62% of SSSIs by area are classed as open access land;
- from a sample of SSSIs, 47% of designated habitats and species were considered to be in favourable condition;
- 25% of SSSIs by area are known to be owned or managed by conservation sector bodies; and
- 62 infringements to SSSI legislation were reported during 2005/6.

This compares with a 2005 review of SSSIs by CCW which found that 29% of the area covered by SSSIs was in favourable condition, 18% was in unfavourable but recovering condition, with a further 52% being in 'unfavourable and declining' condition. The remaining 1% was classified as partially destroyed.

Results of the 2008 reporting round of the UK Biodiversity Action Plan indicate that in Wales:[7]

Habitats:

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[43] Mackey, E.C. and Mudge, G. (2010). Scotland's Wildlife: An assessment of biodiversity in 2010. Scottish Natural Heritage, Inverness.
[44] Countryside Council for Wales (2006) Sites of Special Scientific Interest (SSSIs) in Wales Current state of knowledge Report for April 2005 – Mar 2006

- 5% of priority habitats were increasing (compared to 21% in 2005);
- 5% of priority habitats were stable (compared to 13% in 2005);
- 24% of habitats were declining (continuing/accelerating) (compared to 13% in 2005);
- 26% of habitats were declining (slowing) (compared to 41% in 2005);
- 16% of habitats were fluctuating (compared to 8% in 2005); and
- 8% of habitats showed no clear trend (compared to 5% status unknown in 2005).

Species:

- 7% of species were increasing (compared to 6% in 2005);
- 15% of species were stable (compared to 18% in 2005);
- 16% of species were fluctuating (compared to 14% in 2005);
- 5% of species were declining (slowing) (compared to 6% in 2005);
- 8% of species were declining (continuing/accelerating) (compared to 7% in 2005);
- 3% of species were lost (pre BAP publication) (compared to 4% in 2005);
- 9% of species showed no clear trend (compared to 6% in 2005); and
- The status of 35% of species was unknown (compared to 37% in 2005).

Northern Ireland

Priority habitats and species are monitored over a three-year period by NIEA as an indicator of biodiversity. The overall status and trends of priority habitats and species, for which information is available, has remained relatively unchanged between 2005 and 2008.

Results of the 2008 reporting round of the UK Biodiversity Action Plan indicate that in Northern Ireland:

Habitats:

- 11% of priority habitats were increasing (no change from 2005);
- 11% of priority habitats were stable (compared to 14% in 2005);
- 11% of habitats were declining (continuing/accelerating) (compared to 3% in 2005);

- 17% of habitats were declining (slowing) (compared to 34% in 2005);
- 3% of habitats were fluctuating (no change from 2005);
- 26% of habitats showed no clear trend (compared to 6% in 2005); and
- The status of 20% of habitats was unknown (compared to 29% in 2005).

Species:

- 1% of species were increasing (no change from 2005);
- 6% of species were stable (compared to 9% in 2005);
- 9% of species were fluctuating (compared to 3% in 2005);
- 2% of species were declining (slowing) (no change from 2005);
- 5% of species were declining (continuing/accelerating) (no change from 2005);
- 6% of species were lost (pre BAP publication) (compared to 7% in 2005);
- 7% of species showed no clear trend (compared to 3% in 2005); and
- The status of 54% of species was unknown (compared to 65% in 2005).

In 2005 Northern Ireland Biodiversity Group produced a report which included a range of recommendations of measures that could be undertaken to improve the implementation of the Northern Ireland Biodiversity Strategy and stressed the urgency of these if the 2016 target of halting biodiversity loss is to be achieved.[13]

1.5.2 Sub-regional locations

Plymouth

There have been signs of recovery during the last decade of work for biodiversity, however there is evidence that the region has seen a long term decline in wildlife and that the much less bio-diverse than 50 years ago. Despite this, and due to much conservation effort over the last decade, the region does still retain significant populations of species which are nationally and globally important and notable stretches of habitats.

Biodiversity in Plymouth is generally stable but subject to variations. Locally, populations of migrating birds are of particular importance as they frequent the estuaries of the Plym and Tamar but local reporting is not currently undertaken. Regionally, the population of all native birds in the South West showed little or no change between 1994 and 2004. This was below the national trend which showed an increase of almost 6%. Longer term trends have, however, revealed a considerable decline of 45% in farmland birds, and 32% in woodland birds between 1970 and 1994. This is a much faster decline than the national averages of 5% and 15% respectively (although care needs to be taken with survey comparisons).[45]

The South West Regional Environment Network aims to:[46]

- establish a network of MPAs and MCZs by 2015; and
- increase land from 9%- 20% for resilient habitats and species in urban and rural areas by 2050 through delivery of South West Nature map.

Certain habitats and species have been prioritised through the Devon Biodiversity Action Plan (BAP): estuaries, rocky foreshores, rocky seabeds, otters and Atlantic salmon.[47]

Conservation targets were set by Natural England (in its previous role as English Nature) for Plymouth which covers large shallow inlets and bays, estuaries, sandbanks slightly covered by sea water at all times and SPA features.[48]

Fife

In Fife, there is a trend of increasing fragmentation of habitats due to development pressures. This trend is likely to be somewhat less pronounced in the future, due to a range of biodiversity initiatives and projects within the area, however such actions are unlikely to halt or reverse the trend. There is a trend of increasing proliferation of non native invasive species, which may be exacerbated by climate change. Furthermore, it is likely that sea level rise and changing climatic conditions will result in the loss of some habitats from the area. [49]

There is a trend of declining biodiversity as a result of some agricultural practices. Such changes are likely to be less pronounced in the long term due to a growing emphasis on environmental stewardship promoted by the Scottish Government. There is likely to be a trend of improved condition of designated

[45] Plymouth's Sustainable Community Strategy 2007-2020, http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm

[46] South West Regional Environment Network's Environmental Priorities 2009, http://www.swenvo.org.uk/swren/work/

[47] Fife Local Biodiversity Partnership (2009) Fife Biodiversity Action Plan 2009-2011

[48] English Nature, Plymouth Sound and Estuaries European Marine Site Scheme of management (Regulation 34 Habitats Directive)

[49] Fife Structure Plan - Strategic Environmental Assessment Environmental Report - December 2008 (incorporating February 2009 updates), http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/dev-plan/FifeSP/FifeSEAreport

sites and European Protected Species as a result of management strategies.[50]

The Fife Local Biodiversity Partnership provides specific targets and objectives with reference to different forms of biodiversity. These largely involve their protection and expansion.

1.6 Assessment objective, guide questions and significance

The objectives and guide questions related to biodiversity which have been used in the appraisal of the effects of the SDP proposals are set out in Table 1.1, together with reasons for their selection.

Table 1.1 Approach to assessing the effects of SDP on biodiversity

Objective/guide question	Reasoning
Objective: To protect and enhance biodiversity (habitats, species and ecosystems)	The SEA Directive requires that the likely significant effects on biodiversity should be taken into account in the Environmental Report.
Will the SDP Proposals affect animals or plants including protected species?	The UK Biodiversity Action Plan aims to conserve and enhance biodiversity in the UK and includes Species Action Plans for priority species, including many protected species such as the Great Crested Newt.
Will the SDP proposals affect designated nature conservation sites? e.g. SACs, SPAs and SSSIs?	The Habitats Directive designates SPAs and SACs to maintain or restore important natural habitats and species. The Wildlife and Countryside Act includes legislation relating to protected sites. The UK Biodiversity Action Plan aims to conserve and enhance biodiversity in the UK and includes Species Action Plans. There is a government target of 95% of SSSI area in a favourable or recovering condition by 2010.
Will the SDP proposals affect the structure and function of natural systems (ecosystems)?	Biodiversity is a highly sensitive receptor. It is likely that many of the other topics considered in this report will have an effect on biodiversity. Ecosystems will be sensitive to these interconnected effects.
Will the SDP proposals affect public access to areas of wildlife interest?	The National Parks and Access to the Countryside Act 1949 addresses public rights of way and access to open land
Will the SDP proposals have an impact on fisheries?	The Freshwater Fish Directive includes measures on the quality of fresh waters needing protection or improvement in order to support fish life.

[50] Fife Local Biodiversity Partnership (2009) Fife Local Biodiversity Action Plan 2009-2011

Table 1.2 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the biodiversity objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 1.2 Approach to determining the significance of effects on biodiversity

Effect	Description	Illustrative Guidance
++	Significant positive	• Option would have a significant and sustained positive impact on European or national designated sites and/or protected species. (e.g. – fully supports all conservation objectives on site, long term increase in population of designated species) • Option would have a strong positive effect on local biodiversity (e.g. – through removal of all existing disturbance/pollutant emissions, or creation of new habitats leading to long term improvement to ecosystem structure and function). • Option will create new areas of wildlife interest with improved public access in areas where there is a high demand for access to these sites.
+	Positive	• Option would have a minor positive effect on European or national designated sites and/or protected species (e.g. – supports one of the conservation objectives on site, short term increase in population of designated species). • Option may have a positive net effect on local biodiversity (e.g. – through reduction in disturbance/pollutant emissions, or some habitat creation leading to temporary improvement to ecosystem structure and function). • Option will enhance existing public access to areas of wildlife interest in areas where there is some demand for these sites.
0	No (neutral effects)	• Option would not have any effects on European or national designated sites and/or any species (including both designated and non-designated species). • Option would not affect public right of way or access to areas of wildlife interest.
-	Negative	• Option would have minor residual impact on European or national designated sites and/or protected sites (e.g. – prevents reaching one of the conservation objectives on site, short term decrease in population of designated species). These impacts could not be effectively avoided but could be effectively compensated for. • Option would have minor short-term negative effects on non-designated conservation sites and species (e.g. – through a minor increase in disturbance/pollutant emissions, or some loss of habitat leading to temporary loss of ecosystem structure and function). • Option will decrease public access to areas of wildlife interest in areas where there is some demand for these sites.
--	Significant negative	• Option would have a major negative and sustained effect on European or national designated sites and/or protected species (e.g. – prevents reaching all conservation objectives on site, long term decrease in populations of designated species). These impacts could not reasonably be compensated for. • Option would have strong negative effects on local biodiversity (e.g. – through an minor increase in disturbance/pollutant emissions, or considerable loss of habitat leading to long term loss of ecosystem structure and function).
?	Uncertain	• From the level of information available the impact that the option would have on this objective is uncertain.

1.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the biodiversity objective. **Table 1.3** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 1.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 1.4** below.

Table 1.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than

Category	Assumption Description
	'greenfield' sites, although it is recognised that 'brownfield' land can be important for conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m^2. Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2. As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average).

Category	Assumption Description
	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine • It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since recycling a cleared submarine is little different to recycling a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be

Category	Assumption Description
	transported from the initial dismantling facility to the interim storage facility by sea, rail or road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Table 1.3** are considered in-turn below.

Stage I: Design and Develop Initial Submarine Dismantling Facilities

Biodiversity and Nature Conservation

Option 1: Develop a Greenfield Site for Initial Submarine Dismantling

Assessment of Effects:

It has been assumed for the purposes of this assessment that greenfield sites have greater biodiversity and nature conservation interest features than brownfield. However, it is acknowledged that in some instances brownfield sites can have higher levels of biodiversity than greenfield sites and are included in the list of UKBAP Priority Habitats and Species. As a consequence, it is assumed that the potential for significant adverse effects on biodiversity are greatest if development takes place on a greenfield site (when compared to the two other generic land use categories). This will be exacerbated if the greenfield site includes designated species or habitats.

It is generally expected that the scale of construction on a greenfield site will be greater than for the other options as it is assumed that all/most of the infrastructure and ancillary facilities will be required, including but not restricted to; docks, rail head, roads, cranes and admin offices in addition to the initial dismantling facility. The need for this infrastructure will result in greater land take, which is likely to have a permanent impact on local biodiversity, fauna and flora through direct loss or severance of habitats, direct species loss and long term disruption to populations (if the site includes habitats important for breeding or migration). Aquatic and intertidal environments, including fisheries, may be adversely impacted by construction activities on the waterside and any dredging necessary to establish channels with sufficient depth to accommodate the movement of the submarines to the initial dismantling facility. The biodiversity significance of such potential effects will depend on the nature of the habitats and species affected. Due to the scale of the necessary construction, associated disturbance (e.g. – noise and dust) impacts on flora and fauna are likely to be greater and for a longer duration than those anticipated for the other generic land use categories.

Depending on the nature of the surrounding environment, the associated disturbance may also impact on sites adjacent to the greenfield site. For example, sites located within a wider pristine environment will cause a greater impact on the surrounding area as this area will have a higher biodiversity value and will be more sensitive to disturbance during construction than a site located within a wider brownfield development.

More materials will be required for the greater construction needs and this may result in increased total travel required to deliver materials which may impact on biodiversity, fauna and flora adjoining the local transport networks. The total travel required will also be affected by the location and isolation of the site and in this respect it is considered that greenfield sites may be more likely to be in rural, more isolated areas which will increase the total transport required. The increased need for resources may also indirectly impact on habitats or species through the potential effect on habitats adjacent to the sources of material e.g. - sourcing minerals, aggregate or timber.

An ecosystem is made up of the complex interactions of biotic (living) and abiotic (physical) components. Changes to these interactions are likely to impact on the function and structure of the ecosystem. As Option 1 is expected to have the greatest impact on biodiversity, flora and fauna (see above) as well as the greatest impact on the physical environment (including air, soil, water - see other topic sections) it is expected that complex interactions that alter the structure and function of ecosystems will be more affected by Option 1 than the other options. Due to the complexity of ecosystem interactions it is not possible to know what impacts would occur with any certainty, however, an example of a potential activity impacting on ecosystems is the abstraction and use of water. This may alter the water cycle, affecting quantities and availability of water, which may affect water dependent habitats, both within the site and in the surrounding area. This could impact on species found within these sites including designated migratory species which could use sites for spawning/breeding grounds. Changes to migratory species, such as population or migratory timing/routes could have indirect implications on species in locations much further afield.

There is potential for negative effects as a result of accidental discharges of construction-related materials to water, air or land or from the creation of new pollution pathways. However, it is considered that the probability of such effects is low provided that appropriate pollution control management procedures are adopted to avoid, minimise and/or mitigate this risk.

Without knowing the location of the selected site, existing public access to areas of wildlife interest is unknown. It is assumed that the wildlife interest of a greenfield site will be greater; however, it is also assumed that the site is accessible and important to a local community. There is potential that the loss of a greenfield site located within a predominately developed area will have greater impact, given that it represented a green ‘refuge’ for the local community and were accessibility was greater. However, as acknowledged at the outset of this assessment, there are circumstances where the biodiversity and access significance of a brownfield site maybe greater than that of a greenfield site. In consequence, given these uncertainties regarding public access, this aspect of the assessment is assessed as uncertain.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As a result, it is expected that the environmental effects of construction (e.g. noise and vibration, air quality, traffic, disturbance etc) will be reduced in the short term relative to the Packaged Waste option. Phasing construction may also serve to keep levels of disturbance and emissions to air below levels where they may

Stage I: Design and Develop Initial Submarine Dismantling Facilities **Biodiversity and Nature Conservation**	
adversely affect biodiversity (as ecosystems and species are more likely to be resilient to smaller scale disturbances). Conversely, these options could result in further adverse effects on biodiversity in the longer term as those specialist facilities to package the ILW are developed. **Proposed Avoidance / Mitigation / Enhancements Measures:** • Avoid major new development dredging, or increase in noise levels in locations in or within close proximity of designated natural conservation sites to ensure there is no potential for adverse effects on the integrity of SPAs, SACs, • Where potential for any significant effect on the conservation objectives of a European designated site could arise, undertake a Habitat Regulations Assessment (HRA) and ensure early and ongoing discussion with the relevant statutory conservation body to ensure that effects are avoided or mitigated to an acceptable level. Do not proceed with development proposals that, after avoidance and mitigation, would still have a residual adverse impact on the integrity of a European Site. • Valuable biodiversity habitat or features should be retained where possible and any loss minimised as far as practically possible. Habitat fragmentation should be avoided by minimising the removal of habitat wildlife corridors. Careful consideration should be given to the routing of access roads to prevent/minimise habitat fragmentation. • Where development would result in the loss of habitat, consider on/off site replacement of lost /degraded habitats with alternatives providing an equivalent biodiversity value. • Any opportunities for habitat creation or enhancement, such as any opportunities to contribute towards or meet Local Biodiversity Action Plan targets, should be pursued (e.g. the use of visual screens, spoil heaps and sustainable drainage systems to create wildlife habitat). Any planting should comprise native species that provide habitat for affected ecosystems. • Where appropriate ensure public have access to the new or enhanced biodiversity sites (with sufficient pathways and signage). • Establish a partnership with an appropriate responsible local organisation (local Wildlife Trust or Groundwork Trust) to build on the biodiversity potential of the site(s). • Careful consideration of sourcing natural resources to minimise negative impact on biodiversity and to minimise the distance travelled for construction materials and minerals. • Seek to limit noise, dust and mobilisation of any contaminants during construction as part of Construction Environmental Management Plan (CEMP). • Time/zone construction to avoid development during key breeding, hibernation and migration periods.	
Summary: Option 1 has been assessed as having a potentially significant long term negative effect in relation to this objective due to the significant area of greenfield land likely to be required for development of initial dismantling facilities and the ancillary uses/infrastructure. Given the scale of the facilities, relatively more construction will be required increasing the likelihood of disturbance and disruption to habitats and species. Dredging (if required) is also likely to have an adverse impact on biodiversity in the aquatic and inter-tidal environment. The greater quantities of construction materials required for developing a greenfield site is also expected to impact on biodiversity via sourcing of materials or transportation of materials. Whilst there are numerous uncertainties associated with the assessment, this scale of development and use of greenfield land is likely to have a permanent impact on biodiversity that cannot be mitigated. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As a result, it is expected that the environmental effects of construction (e.g. noise and vibration, air quality, traffic, disturbance etc) will be reduced in the short term relative to the Packaged Waste option. Phasing construction may also serve to keep levels of disturbance and emissions to air below levels where they may adversely affect biodiversity (as ecosystems and species are more likely to be resilient to smaller scale disturbances). Conversely, these options could result in further adverse effects on biodiversity in the longer term as those specialist facilities to package the ILW are developed.	--
Option 2: Develop a Brownfield Site for Initial Submarine Dismantling	
Assessment of Effects: It has been assumed for the purposes of this assessment that greenfield sites have greater biodiversity and nature conservation interest features than brownfield land. However, it is acknowledged that in some instances brownfield sites can have higher levels of biodiversity than	

Stage I: Design and Develop Initial Submarine Dismantling Facilities

Biodiversity and Nature Conservation

greenfield sites and are included in the list of UKBAP Priority Habitats and Species, named "Open Mosaic Habitats on Previously Developed Land". As a consequence, whilst there is potential for adverse effects on biodiversity, if the site comprises brownfield land, it is considered to be far less likely to be significant.

It is assumed that the majority of infrastructure, such as docks, roads and car parks for staff, would be in place to support the development of the initial dismantling facility such that the scale of construction would be less than that under Option 1. Therefore, land take and construction disturbance should be less and, consequently, the impact on existing localised biodiversity reduced. However, wherever land take occurs there is likely to be a permanent impact on local biodiversity, fauna and flora through direct loss or severance of habitats, direct species loss and long term disruption to populations. The biodiversity significance of such potential effects will depend on the nature of the habitats and species affected.

Under Option 2, the level of new capital dredging required is likely to be less than for greenfield sites (as fewer new waterside facilities and approach channels will be needed to be constructed) and therefore, the impact on aquatic/intertidal environments, including fisheries, are likely to be lower than under Option 1.

Depending on the nature of the surrounding environment, the associated disturbance from construction and dredging may also impact on sites adjacent to the brownfield site. For example, development of brownfield sites surrounded by pristine environment will cause a greater impact on the surrounding area as this area will have a higher biodiversity value and will be more sensitive to disturbance during construction than a site located within a wider brownfield development.

In view of the scale of development likely to be required under this option, fewer resources will be required relative to Option 1 which may decrease impacts of transportation and sourcing supplies on flora and fauna.

The impact of Option 2 on biodiversity and on the physical environment (see other topic sections) is expected to be less than that of Option 1 such that the complex interactions that alter the structure and function of ecosystems will be less affected. However, this conclusion will be highly dependent on the nature and sensitivities of the affected ecosystems.

There is potential for accidental discharges of construction-related materials to water, air or land. There is also the potential for the creation of new pollution pathways for existing contaminants on the site depending on the nature of the site selected. This could lead to the mobilisation of previously entrapped contaminants, such as heavy metals, which could have a significant negative effect on the site itself or surrounding areas, this is especially a concern for aquatic environments. However, it is considered that the probability of such effects is low and adoption of pollution control management procedures within a comprehensive CEMP will help mitigate this risk.

It is assumed that brownfield sites are less accessible to a local community than greenfield sites. However, as acknowledged at the outset of this assessment, there are circumstances where the biodiversity and access significance of a brownfield site maybe greater than that of a greenfield site. In consequence, given these uncertainties regarding public access, this aspect of the assessment is assessed as uncertain.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As a result, it is expected that the environmental effects of construction (e.g. noise and vibration, air quality, traffic, disturbance etc) will be reduced in the short term relative to the Packaged Waste option. Phasing construction may also serve to keep levels of disturbance and emissions to air below levels where they may adversely affect biodiversity (as ecosystems and species are more likely to be resilient to smaller scale disturbances). Conversely, these options could result in further adverse effects on biodiversity in the longer term as those specialist facilities to package the ILW are developed.

Proposed Mitigation / Enhancements Measures:

- In addition to the mitigation measures proposed above for Option 1, land and sediment quality assessment surveys and a CEMP will be required to assess the potential for release of existing contamination to air, water or land from construction activities.

Summary: Option 2 has been assessed as potentially having a negative effect on this objective. This is primarily due to the fact that land-take under this option is expected to be relatively small and the intrinsic biodiversity value of a brownfield site is likely to be lower than that of a greenfield site. However, construction activities may lead to the mobilisation of previously inert contaminants contained within the brownfield site arising from past industrial activities. There is the potential for development on brownfield land to utilise existing buildings/materials which will decrease the scale of construction activities and reduce the demand for additional construction materials. Indeed, depending on the previous use of	**-**

Stage I: Design and Develop Initial Submarine Dismantling Facilities Biodiversity and Nature Conservation	
the site, there maybe potential to reuse demolition materials within the construction of the new facilities. Given the uncertainties associated with the site and its potential biodiversity value, whilst it is noted that there will be a reduced effect relative to Option 1, the potential for negative effect on biodiversity remains. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As a result, it is expected that the environmental effects of construction (e.g. noise and vibration, air quality, traffic, disturbance etc) will be reduced in the short term relative to the Packaged Waste option. Phasing construction may also serve to keep levels of disturbance and emissions to air below levels where they may adversely affect biodiversity (as ecosystems and species are more likely to be resilient to smaller scale disturbances). Conversely, these options could result in further adverse effects on biodiversity in the longer term as those specialist facilities to package the ILW are developed.	

Option 3: Develop an Existing Licensed or Authorised Site for Initial Submarine Dismantling

Assessment of Effects:

The on-site biodiversity value of existing Licensed/Authorised sites is expected to be limited and, consequently, any change to the biodiversity value as a result of development of a dismantling facility would be minor. Moreover, land take associated with this option should be small as it is expected that sufficient infrastructure and the majority of ancillary facilities and infrastructure needed to undertake initial dismantling will already be in place such that the scale of construction would be less than that under Option 1 and Option 2. Therefore, land take and construction disturbance should be less and, consequently, the impact on existing localised biodiversity reduced.

It is assumed that the biodiversity value of land adjacent to existing Licensed/Authorised sites will be low as the site is expected to be within a developed area, therefore in this case, effects during construction to these surrounding areas are considered to be minimal. However, existing Licensed/Authorised sites may be located within close proximity to designated marine/terrestrial sites, such as SACs and SPAs. As a result, the significance of impacts on a wider environment will be site dependent and, for the purposes of this generic assessment, unable to determine.

In view of the scale of development likely to be required under this option, fewer resources will be required relative to Option 1 which may decrease impacts of transportation and sourcing supplies on flora and fauna. As the necessary infrastructure, such as docks, should be in place and in use, new capital dredging is unlikely to be required to enable the movement of submarines

The impact of Option 3 on biodiversity and on the physical environment (see other topics) is expected to be less than that of Option 1 and Option 2 such that the complex interactions that alter the structure and function of ecosystems will be less affected.

There is potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to water, air or land. There is also the potential for the creation of new pollution pathways for existing contaminants on the site depending on the nature of the site selected. This could lead to the mobilisation of previously entrapped contaminants, such as heavy metals, which could have a significantly negative effect on the site itself or surrounding areas, this is especially a concern for aquatic environments. However, it is considered that the probability of such effects is low and adoption of pollution control management procedures within a comprehensive CEMP will help mitigate this risk.

It is assumed that existing public access to any area of wildlife interest via an existing Licensed/Authorised site will be restricted. In addition, it can be assumed that the biodiversity value of sites will be less than that of a greenfield site (as proposed under Option 1) such that the option is unlikely to have a significant effect on this aspect of the objective.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As a result, it is expected that the environmental effects of construction (e.g. noise and vibration, air quality, traffic, disturbance etc) will be reduced in the short term relative to the Packaged Waste option. Phasing construction may also serve to keep levels of disturbance and emissions to air below levels where they may adversely affect biodiversity (as ecosystems and species are more likely to be resilient to smaller scale disturbances). Conversely, these options could result in further adverse effects on biodiversity in the longer term as those specialist facilities to package the ILW are developed.

Proposed Mitigation / Enhancements Measures:

- No additional mitigation measures proposed above those set out for Option 1 and Option 2.

Stage I: Design and Develop Initial Submarine Dismantling Facilities Biodiversity and Nature Conservation	
Summary: Option 3 has been assessed as potentially having a negative effect on this objective. This is primarily due to the fact that land-take under this option is expected to be small and the intrinsic biodiversity value of an existing Licensed/Authorised site is likely to be lower than that of a greenfield site. However, construction activities may lead to the mobilisation of previously inert contaminants contained within the site arising from past industrial activities. As a consequence, whilst the direct effects on biodiversity due to land take will be negligible, the potential for indirect effects, particular on the marine environment if sensitive and of conservation importance, could still be negative. There is the potential for development on existing Licensed/Authorised sites to utilise existing buildings/materials which will decrease the scale of construction activities and reduce the demand for additional construction materials. Indeed, depending on the previous use of the site, there maybe potential to reuse demolition materials within the construction of the new facilities. Given the uncertainties associated with the site and its potential biodiversity value, whilst it is noted that there will be a reduced effect relative to Option 1, the potential remains for effects on biodiversity to be negative. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As a result, it is expected that the environmental effects of construction (e.g. noise and vibration, air quality, traffic, disturbance etc) will be reduced in the short term relative to the Packaged Waste option. Phasing construction may also serve to keep levels of disturbance and emissions to air below levels where they may adversely affect biodiversity (as ecosystems and species are more likely to be resilient to smaller scale disturbances). Conversely, these options could result in further adverse effects on biodiversity in the longer term as those specialist facilities to package the ILW are developed.	**-**

SDP Stage II : Design and Develop the Interim ILW Storage Facilities

Biodiversity and Nature Conservation

Option 1: Develop a Greenfield Site for ILW Storage

Assessment of Effects:

Greenfield sites for interim ILW storage facilities would be coastal locations. The development footprint would include subtidal, intertidal and terrestrial habitats, and would likely require dredging of neighbouring marine or estuarine approaches, and development of transport links across neighbouring terrestrial habitats. For a greenfield site, the marine and coastal habitats can be assumed to be of high ecological value, whilst the terrestrial habitats may vary from low to high ecological value, depending on the influence of existing land uses such as agriculture or forestry.

It has been assumed for the purposes of this assessment that greenfield sites have the greatest biodiversity and nature conservation interest of the three generic land use options. As a consequence, it is assumed that the potential for significant adverse effects on biodiversity are greatest if development takes place on a greenfield site (when compared to the two other generic land use options). This will be exacerbated if the greenfield site includes designated species or habitats.

It is generally expected that the scale of construction on a greenfield site will be greater than for the other options as it is assumed that all/most of the infrastructure and ancillary facilities as well as the interim ILW storage facility itself will be required, including but not restricted to; docks, rail head, roads, cranes, inspection and maintenance facilities and admin offices. The need for this infrastructure will result in greater land take, which is likely to have a permanent impact on local biodiversity, fauna and flora through direct loss or severance of habitats, direct species loss and long term disruption to populations (if the site includes habitats important for breeding or migration).

Depending on the technical option and location, dredging could be required of the estuary leading to the greenfield sites in order to establish channels with sufficient depth to accommodate vessels required for the delivery of RC (and potentially the RPV). Along with any other waterside construction, this may adversely impact on aquatic and intertidal environments, including fisheries. The biodiversity significance of such potential effects will depend on the nature of the habitats and species affected.

Due to the scale of the necessary construction, associated disturbance (e.g. – noise and dust) impacts on flora and fauna are likely to be greater and for a longer duration than those anticipated for the other generic land use options. The associated disturbance may also impact on sites adjacent to the greenfield site although its significance will depend on the nature of the surrounding environments.

More construction materials will be required for the interim ILW storage facilities and this may require a greater number of vehicle movements travelling further. This may impact on biodiversity, fauna and flora adjoining the local transport networks. The total travel required will also be affected by the location and isolation of the site; it is considered that greenfield sites may be more likely to be in rural, more isolated areas which will increase the total transport required. The increased need for resources, may also indirectly impact on habitats or species through the potential effect on habitats adjacent to the sources of material e.g. - sourcing minerals, aggregate or timber.

As Option 1 is expected to have the greatest impact on biodiversity, flora and fauna (see above) as well as the greatest impact on the physical environment (including air, soil, water, see other topic sections), it is expected that complex interactions that alter the structure and function of ecosystems will be more affected by Option 1 than the other options.

There is potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to water, air or land or from the creation of new pollution pathways. However, it is considered that the probability of such effects is low (especially for a greenfield site where it is unlikely there will be existing contamination) and adoption of pollution control management procedures will help mitigate this risk.

Without knowing the location of the selected site, the potential effects on existing public access to areas of wildlife interest are unknown.

Technical Options:

The scale of environmental effects for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

Given the requirement for a larger vault and more infrastructure, including an internal rail line, the footprint of the RC storage facility will be much greater than the other storage options. Therefore, it is expected that for RC storage there will be greater areas of greenfield land taken, more construction materials required and greater movements of vehicles which will increase the likelihood of negatively affecting habitats, species and biodiversity locally, as well as in areas adjacent to sourcing materials and along transport networks. Further, it is assumed that the duration of construction of for RC storage will be greater than for the other technical options which will increase the duration of construction disturbance

SDP Stage II : Design and Develop the Interim ILW Storage Facilities Biodiversity and Nature Conservation	
(e.g. noise and dust) and consequently increase the potential for negatively effecting local flora and flora compared to RPV and packaged waste storage. Due to the need to transport RC by sea, RC storage facilities would require the construction of a dock which will further increase construction duration and associated disturbance. In addition, the dredging activities associated with this could have a potentially significant negative effect on the aquatic environment, including fisheries. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised). **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.	
Summary: Option 1 has been assessed as having a negative effect in relation to this objective although this effect has the *potential* to be significant. This is due to the considerable area of greenfield land likely to be required for both development of an interim ILW storage facility and all ancillary uses/infrastructure. Given the scale of the facilities, relatively more construction will be required increasing the likelihood of disturbance and disruption to habitats and species. Dredging is likely to have an adverse impact on biodiversity in the aquatic and intertidal environment. The greater quantities of construction materials required for developing the facility on a greenfield site is also expected to impact indirectly on biodiversity via sourcing and transportation of materials. The scale and potential significance of these effects is most likely to be greatest with the development of the RC storage facility given the increased footprint and duration of construction activities relative to RPV and packaged waste storage options. Due to the need to transport RC (and potentially RPV) by sea, RC and RPV storage facilities would require the construction of a dock; the dredging activities associated with this could have a potentially significant negative effect on the aquatic environment, including fisheries. Given the uncertainties regarding the exact site location and which technical option will be implemented, it is not possible to determine whether the expected negative effect of construction will be significant.	**-/--**
Option 2: Develop a Brownfield Site for ILW Storage	
Assessment of Effects: It has been assumed for the purposes of this assessment that brownfield sites will have a lower biodiversity interest than a greenfield site, although there are instances where a brownfield site can be important for conservation and biodiversity It is assumed that the majority of ancillary infrastructure, such as roads or rail head, docking facilities and a security centre, would be in place to support the development of an interim ILW storage facility. As a consequence, the scale of construction would be less than that under Option 1. The associated effects (land take and construction disturbance) would also be expected to be less and, consequently, the impact on existing localised biodiversity reduced. However, wherever land take occurs, there is likely to be a permanent impact on local biodiversity, fauna and flora through direct loss or severance of habitats, direct species loss and long term disruption to populations. The biodiversity significance of such potential effects will depend on the nature of the habitats and species affected. Under Option 2, it is assumed that the level of dredging (if required at all) would be significantly less (focussed on maintenance of channels to/from the facility) and, therefore, the impact on aquatic/intertidal environments, including fisheries, is likely to be lower than under Option 1. Depending on the nature of the surrounding environment, the associated disturbance from construction and dredging may also impact on sites adjacent to the brownfield site. For example, development of brownfield sites surrounded by pristine environment will cause a greater impact on the surrounding area as this area will have a higher biodiversity value and will be more sensitive to disturbance during construction than a site located within a wider brownfield development. In view of the scale of development likely to be required under this option, fewer resources will be required relative to Option 1 which may decrease impacts of transportation and sourcing supplies on flora and fauna. The impact of Option 2 on biodiversity and on the physical environment (see other topics) is expected to be less than that of Option 1 such that the complex interactions that alter the structure and function of ecosystems will be less affected. However, this conclusion will be highly dependent on the nature and sensitivities of the affected ecosystems. There is potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to water, air or land. There is also the potential for the creation of new pollution pathways for existing contaminants on the site depending on the nature of the site selected. This could lead to the mobilisation of previously entrapped contaminants, such as heavy metals, which could have a significantly negative effect on the site itself or surrounding areas, this is especially a concern for aquatic environments. However, it is	

SDP Stage II : Design and Develop the Interim ILW Storage Facilities Biodiversity and Nature Conservation	
considered that the probability of such effects is low and adoption of pollution control management procedures within a comprehensive CEMP will help mitigate this risk. Without knowing the location of the selected site, existing public access to areas of wildlife interest is unknown. It is assumed that the wildlife interest of a brownfield site will be less than that of greenfield sites; however, it also assumes that the site is inaccessible and less important to a local community. However, as acknowledged at the outset of this assessment, there are circumstances where the biodiversity and access significance of a brownfield site maybe greater than that of a greenfield site. In consequence, given these uncertainties regarding public access, this aspect of assessment is assessed as uncertain. **Technical Options:** The scale of environmental effects for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows: • RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas). • RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above. • Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure. Given the requirement for a larger vault and more infrastructure, including an internal rail line, the footprint of the RC storage facility will be much greater than the other storage options. Therefore, it is expected that for RC storage there will be greater areas of greenfield land taken, more construction materials required and greater movements of vehicles which will increase the likelihood of negatively affecting habitats, species and biodiversity locally, as well as in areas adjacent to sourcing materials and along transport networks. Further, it is assumed that the duration of construction of for RC storage will be greater than for the other technical options which will increase the duration of construction disturbance (e.g. noise and dust) and consequently increase the potential for negatively effecting local flora and flora compared to RPV and packaged waste storage. Due to the need to transport RC by sea, this option may require completion of dredging activities which could have a negative effect on the aquatic environment, including fisheries. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised). **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.	
Summary: Option 2 has been assessed as having the potential to have a negative effect on this objective. This is in part due to the fact that the intrinsic biodiversity value of a brownfield site is likely to be lower than that of a greenfield site and the land-take will be less than Option 1. However, construction activities may lead to the mobilisation of previously inert contaminants contained within the brownfield site arising from past industrial activities. There is the potential for development on a brownfield site to utilise existing buildings/materials which will decrease the scale of construction activities and reduce the demand for additional construction materials. Indeed, depending on the previous use of the site, there may be potential to reuse demolition waste within the construction of new facilities. The severity of these effects may be increased should development comprise a RC storage facility given the increased footprint relative to RPV and packaged waste storage. Due to the need to transport RC (and potentially RPV) by sea, RC/RPV storage facilities may require dredging of the estuary to ensure the maintenance of an accessible channel to the docking facilities. Dredging has the potential to have a negative effect on aquatic/intertidal environments, including fisheries. Given the uncertainties associated with the site and its potential biodiversity value and technical option to be implemented, whilst it is noted that there will be a reduced effect relative to Option 1, the potential remains for the effects on biodiversity to be negative.	**-**
Option 3: Develop an Existing Licensed/Authorised Site for ILW Storage	
Assessment of Effects: The biodiversity value of existing Licensed/Authorised sites is assumed to be the most limited of the three land use options and, consequently,	

SDP Stage II : Design and Develop the Interim ILW Storage Facilities Biodiversity and Nature Conservation	
any effects to the biodiversity value of the site as a result of development of an interim ILW storage facility would be minor. Moreover, land take associated with this option (subject to the technical option implemented) would be small as it is assumed that all sufficient infrastructure and ancillary facilities will be in place. Therefore, land take and construction disturbance would be less than Options 1 and 2 and, consequently, the impact on existing localised biodiversity reduced. It is assumed that the biodiversity value of land adjacent to existing Licensed/Authorised sites will be low as the site is expected to be within a developed area. In this case, therefore, effects during construction to these surrounding areas are considered to be minimal. However, existing Licensed/Authorised sites may be located within close proximity to designated marine/terrestrial sites, such as SACs and SPAs, therefore wider impacts from the construction of the site (particularly if any dredging were required) could be significant. As a result, the significance of impacts on biodiversity will be site dependent and, for the purposes of this assessment, unable to be determined with any certainty. In view of the scale of development likely to be required under this option, fewer resources will be required relative to Option 1 and Option 2 which may decrease impacts of transportation and sourcing supplies on flora and fauna. The impact of Option 3 on biodiversity and on the physical environment (see other topics) is expected to be less than that of Option 1 and Option 2 such that the complex interactions that alter the structure and function of ecosystems will be less affected. There is potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to water, air or land. There is also the potential for the creation of new pollution pathways for existing contaminants on the site depending on the nature of the site selected. This could lead to the mobilisation of previously entrapped contaminants, such as heavy metals, which could have a significantly negative effect on the site itself or surrounding areas, this is especially a concern for aquatic environments. However, it is considered that the probability of such effects is low and adoption of pollution control management procedures within a comprehensive CEMP will help mitigate this risk. It is assumed that existing public access to any area of wildlife interest via a Licensed/Authorised site will be restricted **Technical Options:** The scale of environmental effects for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows: • RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas). • RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above. • Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure. As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.	
Summary: Option 3 has been assessed as potentially having a negative effect on this objective. This is primarily due to the fact that land-take and the intrinsic biodiversity value of an existing Licensed/Authorised site are likely to be less than for a greenfield site. However, construction activities may lead to the mobilisation of previously inert contaminants contained within the site arising from past industrial activities. There is the potential for development on Licensed/Authorised land to utilise existing buildings/materials which will decrease the scale of construction activities and reduce the demand for additional construction materials. Indeed, depending on the previous use of the site, there may be potential to reuse demolition materials within the construction of the new facilities. The size of the interim ILW storage facility required will vary greatly depending upon the technical option implemented. However, it is assumed that the low biodiversity value of an existing Licensed/Authorised site will limit the likelihood of any direct effects from land take on biodiversity being significant. The potential for indirect effects, particularly on the marine environment if sensitive and of conservation importance, could still be negative.	-

SDP Stage II : Design and Develop the Interim ILW Storage Facilities Biodiversity and Nature Conservation

Stage III: Dock Submarines and Remove the Radioactive Materials

Biodiversity and Nature Conservation

Option 1: Reactor Compartment Separation

Assessment of Effects:

Prior to movement, the submarines will have undergone preparation for safe transportation and so it is assumed that there will be no emissions or releases from the submarine during transport. It is not considered that there will be any differences in terms of effects on biodiversity of the three transport options under normal operating conditions. However, in exceptional circumstances, where an accident occurred e.g. submarine grounding, a collision leading to partial or complete sinking, or a major fire leading to pollutant emissions, the impact on biodiversity would likely be significantly negative; however, the likelihood of any such incident occurring is considered to be very low.

There is some potential for the movement of the submarine from its existing location to the initial dismantling facility to spread invasive species (flora or fauna) between waters that could have a negative effect in relation to this objective. In part this will depend on the nature of biota at the initial site, the total distance travelled and the transport method used. With respect to the different land use categories, the potential for spreading invasive species may be greater where the initial dismantling facility has been constructed on a coastal greenfield site and the area has not been subject to prior shipping activity. Notwithstanding this, the probability of any such effect occurring is considered minimal.

All three technical options (RC, RPV and packaged waste) involve common life cycle activities and although there will be minor differences depending on the exact techniques employed, it is assumed that the radioactive and non-radioactive discharges from operations will be minimal across all options and will remain well below statutory levels (being subject to stringent environmental permitting requirements with Best Available Techniques (BAT) principles adopted). There is the potential for impacts, e.g. accidental release of pollutants and radioactive material during initial dismantling including accidental release of untreated discharges or uncontrolled flooding or dewatering in the Dock Bottom Village (DBV). An unplanned release of radiation is likely to negatively affect health and populations of flora and fauna, either directly or indirectly (e.g. - by affecting food supplies) and could alter the structure/balance of ecosystems considerably, especially as different species have varying sensitivities to radiation (e.g. – pine trees were the first type of trees to die from radiation poisoning from Chernobyl whereas leafy species such as birch and oak were reported to have survived the first year of radiation). The risk of a credible unplanned release of radioactivity into the environment will intuitively increase in proportion to the extent of dismantling, although strict legal controls are in place to prevent such events from occurring. As RC separation is the least intrusive of the technical options and allows for further natural radioactive decay prior to size reduction, the already very low risk of any accidental discharge or hazardous materials would be the lowest of the three technical options.

It is envisaged that HGV and other vehicle movements will be required to transport plant equipment, staff and waste to and from site during initial dismantling, which may impact on biodiversity, fauna and flora adjoining the local transport networks. The total travel required will also be affected by the location and isolation of the site, HGV routing and proximity to protected areas. However, it is considered that the number of HGV movement numbers during operation under this option is expected to be the most reduced of the technical options (with further movements deferred until Stage 6), such that any effects with respect to biodiversity will be minor.

Operational activities, including the transportation of the submarine into the dry dock and the separation of the RC could cause an increase in noise and vibration which could have a negative effect on certain species and habitats located adjacent to the initial dismantling facility or transport networks. However, it is considered that noise and vibration from operations will be minimal compared to other stages of the SDP (i.e. – stages 1, 2 and 4) and are expected to be similar to current refit and repair activities.

This option will require the least processing in the medium term and therefore noise and vibration is considered less likely to impact on biodiversity compared to other technical options, depending on the proximity of sensitive receptors to the dismantling site. However, the RC will be required to be size reduced and processed into packaged waste after interim ILW storage, which in the long term will generate an additional phase of potential disruption from noise and vibration. There is potential for development of alternative techniques during this time that could further reduce levels of noise and vibration, but this is very uncertain.

Overall it is considered that any effects from on site noise would be unlikely to be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act 1974), best practice set out in BS 5228:2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites) and Environmental Permitting requirements.

Proposed Mitigation / Enhancements Measures:

- Seek to minimise the distance travelled by submarines between lay up and the initial dismantling facility.

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<tr><td colspan="2">Stage III: Dock Submarines and Remove the Radioactive Materials
Biodiversity and Nature Conservation</td></tr>
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- Monitor species in waters at the initial site of the submarine and initial dismantling site to ensure levels of invasive species do not exceed background levels.
- Consider routing and timing of submarine transportation to avoid protected areas and minimise impacts on sensitive receptors.
- Use an Environmental Management Plan (EMP) to minimise emissions of pollutants such as asbestos and crud to air and water during operation
- Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act. It is likely that this would include consideration of limiting high noise level generating activities during sensitive periods.
- Adopt HGV routing that seeks to avoid protected areas and other sensitive receptors.
- Develop a biodiversity action plan that seeks to monitor the effect of dismantling activities on biodiversity.

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Summary:

Option 1 has been assessed as having a negative effect in relation to this objective. This is because submarine transfer to the initial dismantling facility and RC separation have the potential to adversely affect biodiversity, depending on the proximity of sensitive receptors to the site. However, all processes will be subject to strict environmental permitting, legislation and best practice and as a result are unlikely to have significant long term negative impacts on any SPAs or SACs.

Although the likelihood of accidental discharges through the movement of submarines and during the separation of RCs are considered to be remote, in the event of this occurring there could be a potentially significant negative effect on biodiversity.

HGV movements linked to movement of plant equipment, materials, staff and waste during RC separation has the potential to have a negative effect in relation to biodiversity in adjoining sites and transport networks. However, such transport movements for this option and at this stage are expected to be minimal when compared to other technical options and the effects are not considered as significant.

Noise and vibration will be subject to strict environmental permitting, legislation and best practice and as a result is unlikely to significantly impact on biodiversity surrounding the site.

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<tr><td colspan="2">Option 2: Reactor Pressure Vessel Removal</td></tr>
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Assessment of Effects:

The potential effects on biodiversity associated with transportation of the submarine to the initial dismantling facility will be similar to those described for the processing of the RC. Any potential effects will depend on the method of transport chosen, the total distance travelled and the proximity to sensitive receptors.

All three technical options (RC, RPV and packaged waste) involve common life cycle activities and although there will be minor differences depending on the exact techniques employed, it is assumed that the radioactive and non-radioactive discharges from operations will be minimal across all options and will remain well below statutory levels (being subject to stringent environmental permitting requirements with Best Available Techniques (BAT) principles adopted). There is the potential for impacts, e.g. accidental release of pollutants and radioactive material during initial dismantling including accidental release of untreated discharges or uncontrolled flooding or dewatering in the Dock Bottom Village (DBV). An unplanned release of radiation is likely to negatively affect health and populations of flora and fauna, either directly or indirectly (e.g. - by affecting food supplies) and could alter the structure/balance of ecosystems considerably, especially as different species have varying sensitivities to radiation (e.g. – pine trees were the first type of trees to die from radiation poisoning from Chernobyl whereas leafy species such as birch and oak were reported to have survived the first year of radiation). The risk of a credible unplanned release of radioactivity into the environment will intuitively increase in proportion to the extent of dismantling. Option 2 involves removal of the RPV, and compared to Option 1 at this stage, this may create additional LLW and ILW (specifically, the steam generators, the MCP, pressurisers and associated pipework). Option 2 may therefore have higher operational radiological discharges than for Option 1 and carry a higher pollution risk. However, during initial dismantling activities, safeguards would be in place to prevent any accidental radioactive discharges from reaching

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Stage III: Dock Submarines and Remove the Radioactive Materials Biodiversity and Nature Conservation	
an environmental receptor. As a result, it is considered unlikely that there will be any significant impact from accidental discharges. Potential non-radiological operational effects on biodiversity could include noise and vibration disturbance from the dismantling activities undertaken at site and from the transport of materials, wastes and personnel. Option 2 is expected to be the next lowest in terms of transport movements in comparison to the other technical options (although there will be some movements of LLW to the LLWR) with the remainder of movements deferred to Stage 6. Noise levels are expected to be similar to current refit and repair activities however any noise expected as a result of these activities will still need to adhere to environmental permitting (and potentially best practice) requirements. As a result, noise and vibration is not expected to have a significant effect on biodiversity, although close proximity to sensitive sites could increase this risk. **Proposed Mitigation / Enhancements Measures** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a negative effect in relation to this objective. This is because submarine transfer to the initial dismantling facility and RPV removal have the potential to adversely affect biodiversity, depending on the proximity of sensitive receptors to the site. However, all processes will be subject to strict environmental permitting, legislation and best practice and as a result are unlikely to have significant long term negative impacts on any SPAs or SACs. The greater level of processing under Option 2 when compared to Option 1 and the additional incursion into the RPV creates a potentially greater risk of accidental discharge than for Option 1. Despite this, the likelihood of accidental discharges through the movement of submarine and during RPV removal is considered to be remote. In the event of this occurring there could be a potentially significant negative effect on biodiversity. HGV movements linked to movement of plant equipment, materials, staff and waste during RPV removal has the potential to negatively affect biodiversity, where habitats or sensitive species are adjacent to the transport network due to any associated additional disruption or dust deposition. Option 2 is expected to have increased HGV movements (which are expected to be greater than Option 1 but less than Option 3) due to increased movement of staff, plant equipment, general waste and additional movements due to movement of LLW to the LLWR. Noise and vibration will be subject to strict environmental permitting requirements and as a result is unlikely to significantly impact on biodiversity surrounding the site. However, it is expected that Option 2 will result in increased noise and vibration compared to that identified within Option 1 in the medium term reflecting the scale of operational activity.	**-**
Option 3: Reactor Pressure Vessel Removal and Size Reduction for Storage as Packaged Waste	
Assessment of Effects: The potential effects on biodiversity associated with transportation of the submarine to the initial dismantling facility will be similar to those described for the processing of the RC and RPV. Any potential effects will depend on the method of transport chosen, the total distance travelled and the proximity to sensitive receptors. All three technical options (RC, RPV and packaged waste) involve common life cycle activities and although there will be minor differences depending on the exact techniques employed, it is assumed that the radioactive and non-radioactive discharges from operations will be minimal across all options and will remain well below statutory levels (being subject to stringent environmental permitting requirements with Best Available Techniques (BAT) principles adopted). There is the potential for impacts, e.g. accidental release of pollutants and radioactive material during initial dismantling including accidental release of untreated discharges or uncontrolled flooding or dewatering in the Dock Bottom Village (DBV). An unplanned release of radiation is likely to negatively affect health and populations of flora and fauna, either directly or indirectly (e.g. - by affecting food supplies) and could alter the structure/balance of ecosystems considerably, especially as different species have varying sensitivities to radiation (e.g. – pine trees were the first type of trees to die from radiation poisoning from Chernobyl whereas leafy species such as birch and oak were reported to have survived the first year of radiation). The risk of a credible unplanned release of radioactivity into the environment will intuitively increase in proportion to the extent of dismantling. For Option 3, removal of the RPV and associated components from the RC followed by size reduction and packaging of ILW will be undertaken upfront (i.e. during Stage 3). This	

Stage III: Dock Submarines and Remove the Radioactive Materials **Biodiversity and Nature Conservation**	
option will therefore decrease the time for decay of short lived isotopes and as a consequence, could lead to higher potential planned and unplanned radiological and non-radiological discharges when compared to any option that involves interim storage of either the RC or RPV. However, during dismantling activities, safeguards would be in place to prevent any accidental radioactive discharges from reaching an environmental receptor. As a result, it is considered unlikely that there will be any significant impact from accidental discharges. It is anticipated that there will be relatively higher transport movements for this option (when compared to the two other technical options at this stage). It can be expected that there will be increased transportation required related to general waste, staff and plant equipment movements as well as transportation of increased volumes of LLW to the LLWR. However, this is considered to still be of a scale unlikely to cause significant negative effects on biodiversity in adjoining transport networks. Likewise, the additional noise expected as a result of these activities will still need to adhere to strict legislation, best practice and environmental permitting requirements and noise levels are expected to be similar to current refit and repair activities. As a result, noise and vibration is still not expected to have a significant effect on biodiversity, although close proximity to sensitive sites would increase this risk. **Proposed Mitigation / Enhancements Measures** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective. This is because submarine transfer to the initial dismantling facility and RPV removal and size reduction have the potential to adversely affect biodiversity, depending on the proximity of sensitive receptors to the site. However, all processes will be subject to strict environmental permitting, legislation and best practice and as a result are unlikely to have significant long term negative impacts on any SPAs or SACs. Although the likelihood of accidental discharges through the movement of submarines and during RPV removal and size reduction are considered remote, if such an event were to occur there could be a potentially significant negative effect on biodiversity. Option 3 is expected to generate increased HGV movements (when compared to the other options) due to increased movement of staff, plant equipment, general waste and LLW; however, this is still considered to be on a scale that is unlikely to have significant negative effects on the biodiversity adjoining the transport networks. Noise and vibration will be subject to strict environmental permitting requirements and as a result is unlikely to significantly impact on biodiversity surrounding the site. However, it is expected that Option 3 will result in increased noise and vibration compared to that identified within Options 1 and 2 in the medium term reflecting the scale of operational activity.	**-**

Stage IV: Dismantle the Residual Submarine Hulls and Process Wastes

Biodiversity and Nature Conservation

All Options

Assessment of Effects:

It is assumed that the submarines will have already been drained of the majority of liquids (such as oils, lubricating fluids, coolants and hydraulic fluids) prior to long term storage at the lay-up location. However, there is the possibility that residual liquids will remain within the submarine and these will be removed during the preparation of submarines for dismantling along with any gaseous stores (such as from gas cylinders) and refrigerants (including ammonia and R134 gases). The risk of potential release of these liquids, contaminated water or gases to the receiving environment surrounding the initial dismantling facility during the de-pollution processes is considered very low, given the environmental standards that will be in place (such as environmental permitting requirements, application of BAT and the use of environmental containment and safeguards). Furthermore, given the small volumes considered to be remaining in the submarine should such a release occur it is considered that it is unlikely to have a considerably negative effect on biodiversity.

Submarines will be shot blasted to remove paint and protective coatings, potentially including hazardous wastes such as zinc phosphate, trimite and tanclene. Prior to recycling, it is considered that removal of various aspects of the submarine will be required to allow the processing to take place, this will include the removal of furnishings, cosmetic panelling, tiles, internal systems and insulating materials. This may include hazardous waste such as asbestos, especially within the older vessels. In the event of any uncontrolled release arising from an unplanned incident (such as a fire), the presence and mobilisation of such hazardous materials could have a significantly negative effect on biodiversity. However, as the initial dismantling site will be adhering to requirements of environmental permitting and will be following BAT and best practice standards, it is considered that the risk of such an event occurring is exceptionally low.

There is a risk of accidental discharge of potential contaminants (including fuel and oil from the transporter) during the movement of submarines from the initial dismantling facility to the ship-recycling facility. This could have a negative effect on species, habitats and ecosystems within the receiving marine environment. However, it is considered that any such risk is remote. The subamrines themselves will have undergone preparation for safe transportation, including ensuring their watertight integrity.

In the event of an accident (a collision event, submarine grounding or a major fire event), submarine movement from the initial dismantling facility to the ship recycling facility could impact on local biodiversity. Although if these events were to occur, the impact on biodiversity could be significantly negative, the likelihood of any occurring is very small. The risks associated with the movement will depend upon total distance travelled, the route of movement, proximity to sensitive sites (such as SACs and SPAs) and the choice of transport method (as there will be a choice between 3 options; barge/semi submersible ship, towing or reconnection of the hulls to produce a watertight unit capable of floatation for movement).

Ship recycling will include the removal of large equipment, such as steam plant, pumps, large electrical drive motors. It is assumed that the existing ship recycling facility will already be subject to regulatory requirements to ensure environmental standards are met, therefore the risk of any breach to these standards is very low. For example, it is assumed that safeguards would be in place to prevent any accidental discharges from reaching an environmental receptor.

Overall it is considered that any effects from on site noise, for example, from using plant equipment at the both the initial dismantling facility and ship recycling facility, would be unlikely to be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act 1974), best practice set out in BS 5228:2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites) and Environmental Permitting requirements. Furthermore, within the ship recycling facility the work carried out in the process is considered to be of a similar nature to the activities that already occur on site. Therefore, it is considered that generation of noise, dust and vibration from operation will not be greater than those already experienced and consequently biodiversity will not be adversely affected compared to the current baseline.

HGV movements associated with the movement of plant equipment, wastes, or recycled materials to and from both the initial dismantling facility and the ship recycling facility have the potential to have a negative effect on biodiversity adjoining the transport networks via increases in noise, vibration or emissions. The risk of negative effects will depend upon total travel required (dependant on location and isolation of the sites), HGV routing and proximity to protected areas. It is considered that works occurring at the ship recycling facility will be of a similar nature to those already occurring on site and therefore it is not expected for there to be considerable increases in the number of HGV movements or a significant change to the baseline situation. There may also be an opportunity to transport these materials by sea to prevent against increasing

Stage IV: Dismantle the Residual Submarine Hulls and Process Wastes Biodiversity and Nature Conservation	
HGV movements. **Proposed Mitigation / Enhancements Measures:** • Use an Environment Management Plan (EMP) and appropriate measures to minimise emissions of pollutants to air and water, for example, decanting waste liquids from the de-pollution process into the appropriate and approved waste containers for controlled disposal • Seek to minimise the distance travelled by submarines between the initial dismantling facility and the ship recycling facility. • Consider routing and timing of transportation to avoid protected areas and minimise impacts on sensitive receptors. • Limit high noise level generating activities during sensitive periods. • Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act. • All available transport options for submarine movements should be subject to environmental assessment to determine their effect. • Adopt HGV routing that seeks to avoid protected areas and other sensitive receptors.	
Summary: This stage has been assessed as having a neutral effect in relation to this objective. Although, dismantling and subsequent recycling of the submarine is likely to result in multiple sources of hazardous wastes which could be harmful to biodiversity, including asbestos and chromate paints, it is considered that precautions will be in place to ensure safe disposal (such as specialist asbestos contractors). Given that the quantities of liquid and gaseous wastes within the submarine are considered to be low and that environmental standards and best practice will be followed the risk of accidental discharge during dismantling operations affecting biodiversity is considered to be low. The likelihood of accidental discharges occurring during transportation of the submarines is considered to be low. Furthermore, as all radiological materials and most hazardous materials will be removed from the submarine prior to movement, the risk of accidental discharge having a negative effect on this objective is reduced. Levels of noise, vibration and dust will be similar to those generated in existing ship recycling operations and will be subject to environmental permitting, legislation and best practice. As a result it is considered unlikely that noise, vibration or dust will have an adverse impact on biodiversity surrounding either the initial dismantling facility or ship recycling site.	**0**

Stage V: Transport RC/RPV/ILW to Interim Storage Biodiversity and Nature Conservation	
Option 1: Reactor Compartment Transport to Interim Storage	
Assessment of Effects: The effects of this option (which includes interim ILW storage itself) on biodiversity and nature conservation depends on how far the RC has to travel. If it is kept at or adjacent to the initial dismantling facility (known as the 'point of waste generation') then effects would be minimal. However, if RCs were taken to another coastal location to be stored, the effects could be more pronounced. This assessment has therefore assessed the impacts of moving the RC offsite to ensure that all potential effects are identified. It is considered that approval for transportation of movement of ILW will only be given once the regulator is satisfied that the possibility for accident during transport is minimised and that the radiological content can be effectively contained if such an incident were to occur. Therefore, there will be a minimum standard set across each of option to ensure that the risk of negatively affecting biodiversity through accidental discharge is low. It is assumed that the only method of transportation for the RC from the initial dismantling facility to the interim ILW storage facility will be via sea transport on a barge or heavy lift ship. The RC will contain the RPV which will house a range of radioactive and contaminated materials. Following separation of the RC, as part of the preparation, it is assumed that cut ends will be secured and covered with steel plate as part of the preparation required for transportation to the interim ILW storage facility. It is assumed that this will create a watertight hull. In consequence, unless this hull was ruptured during transport, the existing radioactive materials and contaminants will be secure. In the event of an accident (a collision event, grounding or a major fire event), there is potential for the hull to breached, and the contained contaminants mobilised which could have an impact on biodiversity, although the likelihood of such an event occurring is exceptionally small. Risks associated with the movement will depend upon total distance travelled, the route of movement, proximity to sensitive sites (such as SACs and SPAs) and the choice of transport method. Depending on the distance between the initial dismantling facility and the interim ILW storage facility there is potential for spreading of invasive species between waters which could have a negative effect in relation to this objective. This potential effect could be greater if either of the facilities have been constructed on a greenfield coastal site. This would be due to the fact that prior opportunities for similar transfer and spreading of invasive species would have been limited before the facilities were constructed. The significance of the spreading of invasive species will depend on the species involved, their characteristics and the flora and fauna adjacent to the interim storage facility. However, the likelihood of any such effect occurring, given the total of 27 RC movements required is exceptionally low. Moving RCs may require some channel modification work which could potentially affect aquatic and intertidal environments although this is dependent upon the location(s) and the choice of sea transportation method used. The potential for any radiological and non radiological discharges from the storage of the RC is considered exceptionally low given the containment of all potentially hazardous material within the sealed compartment (which itself is stored within a closed structure). There is the potential for radiological discharges and non radiological discharges from an unplanned incident (such as a fire or explosion at the interim ILW storage facility). However, it is assumed that safeguards would be in place to prevent any such release. If these safeguards were to fail and the discharges were to reach environmental receptors then there could be a significantly negative impact on biodiversity. **Proposed Mitigation / Enhancements Measures:** • Development of a transport environmental assessment for the movement of the RC • Facility design to take consideration of any potential unplanned events including fire, flooding and security • Emergency response plan to address any potential unplanned events	
Summary: Option 1 has been assessed as having a neutral effect on this objective although this effect has the *potential* to be negative. This reflects the fact that the risks of breaching the RC during transportation or interim storage and this resulting in accidental discharge reaching an environmental receptor and affecting this objective is considered very low. Furthermore, the risk of spreading invasive species during transportation is also considered very low and unlikely to impact on this objective. However,	**0/-**

Stage V: Transport RC/RPV/ILW to Interim Storage **Biodiversity and Nature Conservation**	
moving RCs may require some channel modification work which could potentially affect aquatic and intertidal environments although this is dependent upon the location(s) and the choice of sea transportation method used.	

Option 2: Reactor Pressure Vessel Transport to Interim Storage

Assessment of Effects

The RPV could be transported from the initial dismantling facility to the interim ILW storage facility either by sea, rail or road.

Currently a transportation container for the RPV is yet to be developed and its exact nature is yet to be determined; however, as it will have to meet the same standards for containment of any radiological discharge as Option 1, it is considered that the potential for discharges during transportation by sea are the same as Option 1. Similar to Option 1, the risks of spreading invasive species through waters is also considered minimal.

If transportation by rail is chosen, it is assumed that the RPV (and its container pack) would be taken to a rail freight handling site and loaded directly onto a rail bogey. The initial movement from the dismantling facility to the rail freight handling facility would be via a heavy lift HGV. The RPV would then be transported to the interim ILW storage facility. At this stage, it is unknown whether the interim ILW storage facility would have a rail head. Given that the frequency of movement of the RPV would be one per annum, it is not considered that there would be any adverse effects on biodiversity associated with its movement.

If transportation by road is chosen then it is expected that the RPV will fit on one HGV (under special conditions due to its expected weight of approximately 70 tonnes). As it is envisaged that only one submarine will be processed a year, there will only be one HGV movement required to move the RPV from the dismantling site to the interim storage facility. Therefore the increased noise, vibration, and emissions generated by this movement are not expected to have any significant negative effect on flora or fauna in areas adjoining the transport route.

The sealing and packaging of a vessel to store RPV will be designed to minimise the possibility of any radiological discharge from a breach to the container during transport and interim storage.

The potential for any radiological and non radiological discharges from the storage of the RPV is considered exceptionally low given the containment of all potentially hazardous material within the sealed compartment (which itself is stored within a closed structure). There is the potential for radiological discharges and non radiological discharges from an unplanned incident (such as a fire or explosion at the interim ILW storage facility). However, it is assumed that safeguards would be in place to prevent any such release. If these safeguards were to fail and the discharges were to reach environmental receptors then there could be a significantly negative impact on biodiversity

The choice of transport method will influence which type of species and habitats that could be potentially affected in the unlikely event of accidental discharge, i.e. – marine species and habitats could potentially be affected by transport by sea compared to terrestrial (or possibly freshwater) species and habitats if the RPV were transported by road or rail.

Proposed Mitigation / Enhancements Measures

- No additional measures proposed beyond those for outlined for Option 1.

Summary: Option 2 has been assessed as having a neutral effect on this objective. Movement of the RPV by sea, rail or road is not considered to have any adverse effects under normal operating circumstances; although if there were an accidental discharge during transport as a result of an incident, the potential effects on receptors (whether marine or terrestrial) could be significant. However, the risks of accidental discharges affecting environmental receptors and impacting on this objective are extremely low, especially given that all potentially mobile contaminants will have been removed during processing (Stage 3). As any container unit for transport and interim storage will have to meet the same standards for containment of any radiological discharge as under Option 1, it is considered that the potential for discharges during transportation by sea are the same as Option 1: the risks of breaching the containment unit during transportation or interim storage and this resulting in accidental discharge reaching an environmental receptor and affecting this objective is considered very low. Furthermore, the risk of spreading invasive species during transportation is also considered very low and unlikely to impact on this objective.	**0**

Stage V: Transport RC/RPV/ILW to Interim Storage Biodiversity and Nature Conservation	
Option 3: Packaged Waste Transport to Interim Storage	
Assessment of Effects: Packaged waste will comprise size reduced components of the RPV, all will be solid, predominately comprising steels and grouted into a container box for transport. It is assumed that there will be no liquid ILW to be moved as packaged waste. Packaged waste could be transported from the initial dismantling facility to the interim ILW storage facility by either rail or road however, it is assumed that regulator approved 3m^3 containers will be used, irrespective of the mode of transport required. It is estimated that between 4 and 8 containers will be required for the packaged ILW arising from the dismantling of each submarine. An over-pack will also be required for the container during transportation, which although it has not been developed yet, is a common requirement across the nuclear industry to ensure safe and secure transportation of packaged waste. It is estimated that the average weight of the 3m^3 containers and over-pack will exceed normal HGV loads and so special vehicles and permissions maybe required to facilitate the necessary movements between initial dismantling facility and store, if the ILW were to be moved by road. As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated disruption on adjacent sensitive receptors, this frequency would not be considered to pose any effect to biodiversity, under normal operating circumstances. There is the potential for an accidental release arising from a traffic accident in either mode. However, the likelihood of this is exceptionally small, particularly for any movement of packaged waste by rail. In terms of road, rail, sea or air movements, in 2009, there were half a million movements of packaged radioactive waste. There were 32 incidents or accidents recorded. None of these led to any significant radiation doses being received by sensitive receptors (including biota). The potential for any radiological and non radiological discharges from the storage of the packaged waste is considered exceptionally low given the containment of all potentially hazardous material within the sealed container (which itself is stored within a closed structure). There is the potential for radiological discharges and non radiological discharges from an unplanned incident (such as a fire or explosion at the interim storage facility). However, it is assumed that safeguards would be in place to prevent any such release. If these safeguards were to fail and the discharges were to reach environmental receptors then there could be a significantly negative impact on biodiversity **Proposed Mitigation / Enhancements Measures** • No additional measures proposed beyond those for outlined for Option 1.	
Summary: Option 3 has been assessed as having a neutral effect on this objective. The risks of radiological discharges reaching environmental receptors and impacting on this objective are extremely low, given that the ILW stored within the packaged waste containers will be immobilised in grout and comprise predominately steel. There is a very low risk of a discharge associated with an unplanned event such as an accident during transport; however, this is considered exceptionally unlikely. There is the potential for non-radiological discharges associated with the movement of the packaged waste arising from the effects from noise, dust and vehicle emissions on biota. However, due to the very low frequency of vehicle movements (maximum of 8 per annum), it is not considered to pose any effect to biodiversity, under normal operating circumstances. The potential for any radiological and non radiological discharges from the storage of the packaged waste is considered exceptionally low given the containment of all potentially hazardous material within the sealed container (which itself is stored within a closed structure).	**0**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF

Biodiversity and Nature Conservation

Option 1: Size Reduce the Reactor Compartment and Transfer Packaged Waste to the Proposed GDF

Assessment of Effects:

Depending on the location of the interim ILW storage facility and where RCs are finally dismantled, there may be a requirement to transport RCs. It is expected that, due to the size and weight of RCs, this will only occur by sea and by barge or heavy lift vessel. As RCs will be sealed (in accordance with the Transport Regulations), it is not expected that there will be any discharge of radiological contaminants. It is also assumed that RCs would be passively safe (i.e. all liquids and potentially mobile radioactive materials would be removed or immobilised) and as such it is not expected that there will be any risk of accidental discharge of radiological contaminants during transportation.

Depending on the distance between the interim ILW storage facility and the size reduction facility there is potential for spreading of invasive species between waters which could have a negative effect in relation to this objective. This potential effect could be greater if either of the facilities have been constructed on a greenfield coastal site. This would be due to the fact that prior opportunities for similar transfer and spreading of invasive species would have been limited before the facilities were constructed. The significance of the spreading of invasive species will depend on the species involved, their characteristics and the flora and fauna adjacent to the interim ILW storage facility. However, the likelihood of any such effect occurring, given the total of 27 RC movements required is exceptionally low.

There may be a need to undertake channel modification clearance work in order to accommodate the movements of RCs which could potentially affect aquatic and intertidal environments although this is dependent upon the location(s) and the choice of sea transportation method used.

RC processing will involve cutting into in the RC casing and removal of all systems and equipment with connections to the RPV being sealed individually. The RPV will then be removed from the RC using either heavy lifting craneage or jack lifting equipment and subsequently moved inside the size reduction facility. Within the facility, the RPV will be size reduced and ILW packaged using well understood remote handling, cutting, containment and lifting techniques performed by skilled nuclear workers. Once the RPV has been removed the remaining RC casing which is expected to be non-radioactive will be cut up and size reduced on site. All items removed or size reduced from the RC casing will be monitored, characterised and transferred to a suitable waste processing facility for recycling or disposal as appropriate. It is expected that there will be likely effects associated with this activity such as noise, vibration and potential emissions to air (dust) from cutting activities and transport movements and are expected to be of a similar nature to other activities undertaken on a ship dismantling facility. However, it is uncertain as to where the cut up and size reduction of the RC casing will take place within the SDP site and subsequently the level of shielding that will be provided. The scale of effect of this activity is therefore uncertain at this point.

It is assumed that the radioactive and non-radioactive discharges from operations will be minimal across all options and will remain well below statutory levels (being subject to stringent environmental permitting requirements with BAT principles adopted). For example, a high efficiency, filtered extraction ventilation system for RPV removal work should prevent discharges of dust and particulates. Routine discharges are expected to be greater under this option than for Options 2 and 3 during this stage of the SDP process primarily due to the requirement for removal of RC components (for Options 2 and 3 these works would have been undertaken during Stage 3). However, as set out under the assessment of this option for Stage 3, the delay in works will result in a reduction of the total activity that could potentially be discharged to the environment during normal operations. In addition, delay (given that it will be at least 30 years before cut up begins) may provide sufficient time to enable new cut up techniques to be developed and applied (in accordance with the BAT), which should ensure that future operational discharges of both radiological emissions and non-radiological emissions will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain.

There is the potential for impacts (e.g. accidental release of pollutants and radioactive material) during RPV deplanting including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV. As set out under Stage 3 of this assessment, an unplanned release of radiation is likely to negatively affect health and populations of flora and fauna, either directly or indirectly (e.g. - by affecting food supplies) and could alter the structure/balance of ecosystems considerably, especially as different species have varying sensitivities to radiation. However, for all activities it is assumed that safeguards would be in place to prevent any accidental radioactive and non-radioactive discharges from reaching an environmental receptor and operational activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. Overall therefore, it is considered unlikely that there will be any significant impact on biodiversity from accidental discharges.

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Biodiversity and Nature Conservation	
HGV and other vehicle movements will be required to transport plant equipment, staff and waste to and from site which may impact on biodiversity, fauna and flora adjoining the local transport networks. The total travel required will also be affected by the location and isolation of the site, HGV routing and proximity to protected areas. However, it is considered that the number of HGV movements during operation is expected to be small such that any effects with respect to biodiversity will be minor. Initial operational activities including, for example, the transfer of the RC from the interim ILW storage facility and removal of RPVs will result in an increase in noise and vibration which could have a negative effect on certain species and habitats located adjacent to either of the dismantling facility and the size reduction facility. However, it is considered that noise and vibration from operations will be minimal and are expected to be similar to current refit and repair activities. Works associated with processing of the RPV and packaging would be undertaken inside a size reduction facility building and consequently it has been assumed that noise and vibration associated with this element would be contained within the site such that any adverse effects on biodiversity would be minor. Overall, it is considered that any effects from on site noise would be unlikely to be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act 1974), best practice set out in BS 5228:2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites) and Environmental Permitting requirements. **Proposed Mitigation / Enhancements Measures:** • Time any required dredging to avoid disruption during key breeding, hibernation and migration periods and deploy measures such as a silt curtain or silt screen to minimise negative effects. • Monitor species in waters at the initial site of the submarine and dismantling site to ensure levels of invasive species do not exceed background levels. • Use Environmental Management Plan (EMP) to minimise emissions of pollutants such as asbestos and crud to air and water during operation. • Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act. It is likely that this would include consideration of limiting high noise level generating activities during sensitive periods. • Adopt HGV routing that seeks to avoid protected areas and other sensitive receptors. • Develop a biodiversity action plan that seeks to monitor the effect of dismantling activities on biodiversity.	
Summary: Option 1 has been assessed as having a neutral effect on this objective although this effect has the *potential* to be negative. RPV removal has potential to have adversely affect biodiversity depending on the proximity of sensitive receptors to the site. Although the likelihood of accidental discharges during dismantling of the RC to packaged waste is considered to be remote, if such an event were to occur there could be a potentially significant negative effect on biodiversity. The risks of radiological discharges reaching environmental receptors during the transportation of packaged waste are extremely low, given that the ILW stored within the approved containers will be immobilised in grout and comprise predominately of steel. There is a very low risk of a discharge associated with an unplanned event such as an accident during transport; however, this is considered exceptionally unlikely. There is the potential for non-radiological discharges associated with the movement of staff, plant equipment, general waste, LLW and ILW including noise, dust and vehicle emissions. In this respect, Option 1 is expected to have increased HGV movements (when compared to the other options) however, this is still considered to be on a scale that is unlikely to have significant negative effects on the biodiversity adjoining the transport networks. Noise and vibration is likely to be increased under this option primarily due to the requirement to remove the RPV and for subsequent recycling of the remaining non-radioactive RC hull. However, operational activities will be subject to strict environmental permitting, legislation and best practice and as a result is unlikely to significantly impact on biodiversity surrounding the initial dismantling facility and size reduction facility.	**0/-**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Biodiversity and Nature Conservation	
Option 2: Size Reduce the Reactor Pressure Vessel and Transfer Packaged Waste to the Proposed GDF	
Assessment of Effects The type and range of potential effects on biodiversity under this option are expected to be broadly similar to those associated with Option 1. However, the risk of a credible unplanned release into the environment will decrease as the scale of works associated with this option is less than for Option 1 (as the removal of RC components will have been undertaken during Stage 3 of the SDP process) with dismantling of the RPV to packaged waste taking place inside a size reduction facility which is expected to contain any discharges should they arise. Potential non-radiological operational effects on biodiversity including noise and vibration disturbance from operational activities and the transport of materials, wastes and personnel are expected to be less than for Option 1. This reflects the fact that RPV removal would not be required under this option and, therefore, there would not be any disturbance for example associated with cutting of the RC hull or the use of equipment to move the RPV from the initial dismantling facility to the size reduction facility. As under Option 1, RPV size reduction to packaged waste would be undertaken inside a size reduction facility building and consequently, it is expected that any associated emissions, noise and vibration would be contained within the site such that there would not be any significant adverse effects on biodiversity due to this element of the works. It is also expected that HGV and other vehicle movements would be reduced under this option as the volume of waste arisings (both LLW and non-radioactive) requiring transportation would be less than for Option 1 reflecting the fact that systems and equipment contained within the RC will have already been removed and some size and weight reduction of the RPV would have been undertaken during Stage 3. Consequently, it is likely that any impact on biodiversity, fauna and flora adjoining the local transport networks would be reduced relative to Option 1. However, there is potential for RPVs to be transported by road or rail from the interim ILW storage facility to the size reduction facility which would require the use of a wide/abnormal load vehicle and security escort generating additional emissions, noise and vibration, although it is expected that any effects would only be temporary and infrequent (as only a single RPV would transported per year) and, consequently, are unlikely to be significant. **Proposed Mitigation / Enhancements Measures** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a neutral effect on this objective. Under this option RPV removal would not be required and it is envisaged that the majority of operational activity would take place inside a size reduction facility building which is expected to contain any discharges should they arise thereby mitigating any adverse effects on biodiversity. The risk of accidental discharges under this option is considered to be remote and less than for Option 1 (as the removal of RC components will have already taken place). However, if such an event were to occur there could be a potentially significant negative effect on biodiversity. The risks of radiological discharges reaching environmental receptors during the transportation of packaged waste are extremely low, given that the ILW stored within the containers will be immobilised in grout and comprise predominately steel. There is a very low risk of a discharge associated with an unplanned event such as an accident during transport. There is the potential for non-radiological discharges associated with the movement of staff, plant equipment, general waste, LLW and ILW including noise, dust and vehicle emissions. However, the frequency of movements under this option is considered to be of a scale that is unlikely to have significant negative effects on the biodiversity adjoining the transport networks. Noise and vibration arising from operational activities on-site will be subject to strict environmental permitting, legislation and best practice and as a result is unlikely to significantly impact on biodiversity surrounding the size reduction facility.	**0**
Option 3: Transport Packaged Waste to the Proposed GDF	

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Biodiversity and Nature Conservation	
Assessment of Effects: Under Option 3 all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process) and consequently, effects on this objective will relate to the transportation of packaged waste to the proposed GDF only. These effects are expected to be similar to those associated with the transportation of packaged waste identified under Options 1 and 2. There is the potential for packaged waste to be transported at a higher frequency than 8 separate movements per annum as under this option no further processing prior to transportation to the proposed GDF would be required although this is dependent on the number of over packs available and GDF availability to receive packaged waste. An increase in frequency may impact on biodiversity, fauna and flora adjoining the local transport networks however, as a high end estimate, if all packaged waste was to be moved over a period of 1 year with 2 overpacks, transport movements would occur approximately 4 times per week. It is considered that this frequency of movement is unlikely to be of a scale that would adversely affect biodiversity especially taking into account the fact that there would be no (or very few) standard HGV movements associated with this option. Notwithstanding this, it is recognised that the severity of any adverse effects is subject to routing and the sensitivity of biodiversity, fauna and flora adjoining the local transport networks. **Proposed Mitigation / Enhancements Measures** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Under Option 3 all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process) and consequently effects on biodiversity relate to the transportation of packaged waste to the proposed GDF only. The risks of radiological discharges reaching environmental receptors during the transportation of packaged waste to the proposed GDF are extremely low given that the ILW stored within the containers will be immobilised in grout and comprise predominately of steel. There is a very low risk of a discharge associated with an unplanned event such as an accident during transport. There is the potential for non-radiological discharges associated with the movement of the packaged waste arising from the effects from noise, dust and vehicle emissions on biota. However, due to the assumed very low frequency of vehicle movements (maximum of 8 per annum), it is not considered to pose any effect to biodiversity, under normal operating circumstances.	**0**

Stage VII: Decommission SDP Facilities

Biodiversity and Nature Conservation

Option 1: Decommission Greenfield Sites

Assessment of Effects:

It is assumed that the decommissioning of SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility following the completed transfer of packaged waste to the proposed GDF and confirmation that there is no further need for the facilities. It has been assumed for the purposes of the generic assessment that the agreed end state will be restoration back to the original greenfield condition.

Achieving this end state will involve the removal of all hardstanding and infrastructure; including; docks, rail head, roads, cranes, inspection and maintenance facilities and admin offices. As a consequence, it is generally expected that the scale of decommissioning of facilities built on greenfield land will be greater than for the other options as it is assumed that all/most of the infrastructure and ancillary facilities as well as the will be required to be demolished. Furthermore in order to restore the land to its original greenfield state, all hardstanding will need to be removed increasing the levels of land excavation required.

Due to the increased demolition and land excavation needed, associated disturbance (e.g. – noise and dust) impacts on flora and fauna surrounding both the dismantling/size reduction and storage sites are likely to be greater and for a longer duration than those anticipated for the other generic land use categories.

Decommissioning activities will involve the demolition, excavation, movement and treatment of radiologically contaminated material, particularly arising from the size reduction facility (e.g. the hot cell). Most radiologically contaminated materials are expected to be solid, comprising a selection of concrete and cut up apparatus such as pipes and cladding although there is some potential that small amounts of liquids (crud and sludge) from the effluent treatment plant will be present, the discharge of which could significantly impact upon biodiversity. However, it is assumed that all activities will be subject to BAT and ALARP and that containment mechanisms would be in place to prevent discharge to the environment. There is a potential risk of accidental discharge of radiation during decommissioning although the probability of any such discharges having a significant impact on biodiversity will be low given that decommissioning activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. These requirements will ensure that any discharges to the environment are both minimised, and within the limits defined in the site permit.

Due to the increased scale of decommissioning activities required to remove all buildings, infrastructure and hardstanding in order to restore sites to their previous greenfield condition, it is assumed that increased volumes of general waste will be produced. This will increase the number of vehicle movements needed to transport the waste off-site for disposal. There would also be an increase in the number of vehicle movements required to move staff and equipment during the longer decommissioning period. This would be in addition to the vehicle movements associated with movement of ILW (likely to be present in the hot cell, cut up apparatus and steels within the facility structures) to the proposed GDF and LLW to a repository site, which are expected to remain the same across each of the land use options. The overall increase in number of vehicle movements compared to other options will increase the potential for negatively affecting biodiversity, fauna and flora adjoining the local transport networks. The total travel required will also be affected by the location and isolation of the sites; it is considered that sites which were previously greenfield sites may be more likely to be in rural, more isolated areas which will increase the total transport required.

However, it is assumed that the biodiversity value of the SDP sites following years of operation will be low and therefore, any effects to the biodiversity value of the sites as a result of decommissioning and demolition activities would be minor. However, depending on the nature of the areas surrounding the site, there is the potential for negative effects for biodiversity from disturbance during decommissioning. It is considered that Option 1 sites are more likely to be surrounded by greenfield/pristine environments with a higher biodiversity/conservation interest and therefore the potential for significant adverse effects on biodiversity are greater for Option 1 than the two other generic land use categories. This will be exacerbated if the surrounding areas include designated species or habitats.

Following demolition of the sites, it is assumed that restoration activities will restore the sites from expected low levels during operation of the sites to their previous high biodiversity value. This will be achieved through activities such as removal of all hazards from sites, land remediation, landscaping, habitat restoration, re-introduction of species and restoration of aquatic/intertidal environments. Once these activities are completed it is expected that it will take time for the flora, fauna and ecosystems to establish in order to support the same biodiversity levels found at the site prior to development. Furthermore the cessation of SDP operational activities (assessed in Stages 3 to 6) will also remove any of the potential associated negative effects on biodiversity. The gradual recovery of biodiversity will have a significant long term positive effect for this objective within the site and the surrounding areas. There is also the opportunity during restoration activities to enhance the sites to support greater biodiversity levels than previous to development, for example, through introduction of new habitats or landscape design.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim

Stage VII: Decommission SDP Facilities **Biodiversity and Nature Conservation**	
ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. RC storage will require decommissioning of a relatively large interim storage facility compared to the other technical options and, on a greenfield site, removal of docking facilities alongside other infrastructure would also be required, which has the potential to negatively affect marine and intertidal environments. Therefore, it is expected that for RC storage there will be a higher volume of vehicle movements associated with the decommissioning of the interim storage facility (as the number of contractors, and volume of waste arisings and materials is expected to be greater) which will increase the likelihood of activities negatively affecting habitats, species and biodiversity locally, as well as alongside transport networks. Furthermore, it is assumed that the duration of decommissioning activities under the RC storage option will be greater than for RPV and packaged waste storage options (due to the increased size of facility to be demolished and area of land to be restored) which will extend the duration of disturbance (e.g. – noise and dust) and consequently increase the potential for negatively effecting local flora and flora. **Proposed Mitigation / Enhancements Measures:** • Where potential for any adverse effect on the conservation objectives of a European designated site could arise, undertake a Habitat Regulations Assessment (HRA) and ensure early and ongoing discussion with the relevant statutory conservation body. • Any opportunities for habitat creation or enhancement, such as any opportunities to contribute towards or meet Local Biodiversity Action Plan targets, should be pursued (e.g. the use of visual screens, spoil heaps and sustainable drainage systems to create wildlife habitat). Any planting should comprise native species that provide habitat for affected ecosystems. • Where appropriate ensure public have access to the new or enhanced biodiversity sites (with sufficient pathways and signage). • Establish a partnership with an appropriate responsible local organisation (local Wildlife Trust or Groundwork Trust) to build on the biodiversity potential of the site(s). • Seek to limit noise, dust and mobilisation of any contaminants during demolition as part of a Demolition Environmental Management Plan (DEMP). • Time/zone decommissioning to avoid development during key breeding, hibernation and migration periods.	
Summary: Option 1 has been assessed as having a significant positive effect on this objective in the long term as sites will be restored, through land remediation, habitat restoration, landscaping and re-introduction of species, from a relatively low biodiversity level following development back to the greenfield condition and biodiversity value prior to development. There is also the potential to further enhance biodiversity to levels above those found on site previously through the introduction of new habitats and landscape design. The short to medium term negative effects for biodiversity on site during the demolition and land excavation phase of decommissioning are expected to be minimal and for a relatively short duration compared to the long term effects from restoration on site, especially given the low biodiversity value expected at the site following operation. Due to the increased scale of decommissioning, Option 1 is considered to have a greater potential to negatively affect flora, fauna and biodiversity areas surrounding the sites during this period, especially as these areas are more likely to have a higher biodiversity value than other options, although this is still considered to be small and short term compared to affects from restoration. RC storage will require decommissioning of a relatively large interim storage facility compared to the other technical options and it is therefore expected that the likelihood of activities negatively affecting habitats, species and biodiversity locally, as well as alongside transport networks will be increased. RC storage will also require the removal of waterside facilities which would increase the potential of negatively affecting marine and intertidal environments. Furthermore, it is assumed that the duration of decommissioning activities under the RC storage option will be greater (due to the increased size of facility to be demolished and area of land to be restored) which will extent the duration of disturbance (e.g. – noise and dust) and consequently increase the potential for negatively effecting local flora and flora. That being said, it is unlikely that the increased scale of activities under the RC storage option will significantly alter the severity of effects on this objective.	**-/++**

Stage VII: Decommission SDP Facilities

Biodiversity and Nature Conservation

Option 2: Decommission Brownfield Sites

Assessment of Effects:

Given that the majority of ancillary infrastructure (such as roads or rail head, docking facilities and security centre) and much of the hardstanding would have been present at a brownfield site prior to development it is expected that the scale of demolition and land excavation required to restore sites to their previous condition would be less than under Option 1. The associated demolition/land excavation disturbance would also be expected to be less and for a shorter duration, consequently, the impact on existing localised biodiversity is expected to be reduced. Similar to Option 1, it is assumed that the biodiversity value of the SDP sites will be low following years of operation, and therefore the effects to the biodiversity are expected to be minor. The significance of effects on areas surrounding the sites will depend on the nature of the surrounding environment. For example, brownfield sites surrounded by pristine environment will cause a greater impact on the surrounding area as this area will have a higher biodiversity value and will be more sensitive to disturbance during construction than a site located within a wider brownfield development.

Given the reduced demolition and land excavation required under Option 2, it is expected that decommissioning will generate less general waste which will decrease the volumes of waste transported off site for disposal (although ILW and LLW volumes arising from demolition of the size reduction facility are expected to remain the same across the land use options). This, along with the reduced need for movement of staff and equipment will decrease the total number of vehicle movements required and reduce the potential for negatively affecting biodiversity, fauna and flora adjoining local transport networks during decommissioning compared to Option 1.

Following demolition/decommissioning of SDP sites, it is assumed that restoration activities (such as land remediation) will restore the site to its previous biodiversity value. It is expected that the previous biodiversity value of a brownfield site will be lower than a greenfield site and therefore the restoration work required will be less, although there are instances where a brownfield site can be important for conservation and biodiversity. It is also assumed that the cessation of SDP operational activities (assessed in stages 3 to 6) will also remove any of the potential associated negative effects on biodiversity.

It is expected that all land that has been contaminated through any of the SDP stages will be treated and restored to its original condition through land remediation during decommissioning. Depending on the extent the sites were contaminated prior to SDP, there would be an opportunity to decrease total land contamination on the sites, either through removal of contaminated soil prior to SDP development and ex-situ treatment or through land remediation during decommissioning phase.

It is assumed that once decommissioning and restoration activities are completed that the public access to the sites will be returned to the same level as prior to development.

Following demolition of the sites, it is assumed that restoration activities will restore the sites from expected low levels during operation of the sites to their previous biodiversity value. Once these activities are completed it is expected that it will take time for the flora, fauna and ecosystems to establish in order to support the same biodiversity levels found at the site prior to development. Furthermore the cessation of SDP operational activities (assessed in stages 3 to 6) will also remove any of the potential associated negative effects on biodiversity. The gradual recovery of biodiversity will have a long term positive effect for this objective within the site and the surrounding areas. There is also the opportunity during restoration activities to enhance the sites to support greater biodiversity levels than previous to development, for example, through introduction of new habitats or landscape design.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

Stage VII: Decommission SDP Facilities **Biodiversity and Nature Conservation**	
RC storage will require decommissioning of a relatively large interim storage facility compared to the other technical options. Therefore, it is expected that for RC storage there will be a higher volume of vehicle movements associated with the decommissioning of the interim storage facility (as the number of contractors, and volume of waste arisings and materials is expected to be greater) which will increase the likelihood of activities negatively affecting habitats, species and biodiversity locally, as well as alongside transport networks. Furthermore, it is assumed that the duration of decommissioning activities under the RC storage option will be greater than for RPV and packaged waste storage options (due to the increased size of facility to be demolished and area of land to be restored) which will extend the duration of disturbance (e.g. – noise and dust) and consequently increase the potential for negatively effecting local flora and flora. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: Option 2 has been assessed as having a minor long term positive effect on this objective as operational activities and associated minor negative effects on biodiversity would stop and the SDP sites will be restored to their previous biodiversity value and brownfield status. There is also the potential that restoration activities could improve the biodiversity value of the sites, depending on the range of habitats created, species planted or landscaping undertaken. There would be short term negative effects for biodiversity on site during the demolition and land excavation phase of decommissioning, however given the low biodiversity value expected at the sites following operation, this is expected to be minor. Furthermore, given that the majority of infrastructure would have been present at brownfield sites prior to development, the scale of demolition and land excavation required to return SDP sites to their previous condition will be less and the potential for negative effects on biodiversity both on site and surrounding areas reduced relative to Option 1. RC storage will require decommissioning of a relatively large interim storage facility compared to the other technical options and it is therefore expected that the likelihood of activities negatively affecting habitats, species and biodiversity locally, as well as alongside transport networks will be increased. Furthermore, it is assumed that the duration of decommissioning activities under the RC storage option will be greater (due to the increased size of facility to be demolished and area of land to be restored) which will extent the duration of disturbance (e.g. – noise and dust) and consequently increase the potential for negatively effecting local flora and flora. That being said, it is unlikely that the increased scale of activities under the RC storage option will significantly alter the severity of effects on this objective.	**-/+**
Option 3: Decommission an 'Existing' Licensed/Authorised Site	
Assessment of Effects: It is assumed that only the SDP facilities themselves will be required to be removed during decommissioning under this option and that all/most infrastructure and ancillary facilities required would have been present at both sites prior to development. Therefore, demolition and land excavation activities and associated disturbance would be less than for Options 1 and 2 and of a shorter duration, and the associated impact on biodiversity within the site will be reduced. However, in all cases it is assumed that the biodiversity value of SDP sites will be low following years of operation. Given the reduced demolition and land excavation required under Option 3, it is expected that decommissioning will generate less general waste. This will decrease the volumes of waste transported off site for disposal (although it is expected that ILW and LLW volumes is expected to remain the same across the land use options). This, along with the reduced need for movement of staff and equipment will decrease the total number of vehicle movements required and reduce the potential for negatively affecting biodiversity, fauna and flora adjoining local transport	

Stage VII: Decommission SDP Facilities Biodiversity and Nature Conservation	
networks during decommissioning compared to Option 1. It is assumed that the biodiversity value of land adjacent to existing sites will be low as the Licensed/Authorised sites are expected to be within a developed area, therefore in this case, effects during decommissioning to these surrounding areas are considered to be minimal. However, Licensed/Authorised sites may be located within close proximity to designated marine/terrestrial sites, such as SACs and SPAs, therefore wider impacts from the decommissioning of the site could be significant. As a result, the significance of impacts on biodiversity will be site dependent and, for the purposes of this assessment, unable to be determined with any certainty. It is expected that all land that has been contaminated through any of the SDP stages will be treated and restored to its original condition through land remediation during decommissioning. Depending on the extent the sites were contaminated prior to SDP there would be an opportunity to decrease total land contamination on the sites, either through removal of contaminated soil prior to SDP development and ex-situ treatment or through land remediation during decommissioning phase. As it is assumed that the biodiversity value of Licensed/Authorised sites was considered to be limited prior to development it is expected that the remediation and restoration activities required to restore the sites to their state prior to development is considered to be less than for the other land use options. It is expected that all land that has been contaminated through any of the SDP stages will be treated and restored to its original condition through land remediation during decommissioning. Depending on the extent the sites were contaminated prior to SDP, there would be an opportunity to decrease total land contamination on the sites, either through removal of contaminated soil prior to SDP development and ex-situ treatment or through land remediation during decommissioning phase. It is assumed that existing public access to any area of wildlife interest via a Licensed/Authorised site would be restricted prior to development and as the use of the site is expected to remain licensed it is expected that this will continue following decommission. **Technical Options:** As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: Option 3 has been assessed as having a minor long term positive effect on this objective as in the long term the SDP operational activities and the associated negative effects on biodiversity will cease and the sites will be restored to their previous biodiversity value. This is considered to be a relatively straightforward process for Licensed/Authorised sites as the previous biodiversity value is expected to be low. There is the potential that restoration activities will improve the biodiversity value of the sites, depending on the range of habitats created, species planted or landscaping undertaken; however, the extent to which this is taken up is uncertain. Given that most/all infrastructure would have been present at Licensed/Authorised sites prior to development, the scale of demolition and land excavation required to return SDP sites to their previous condition will be less and the potential for negative effects on biodiversity both on site and surrounding areas during decommissioning activities within the short to medium term are reduced relative to Options 1 and 2. RC storage will require decommissioning of a relatively large interim storage facility compared to the other technical options and it is therefore expected that the likelihood of activities negatively affecting habitats, species and biodiversity locally, as well as	**-/+**

Stage VII: Decommission SDP Facilities Biodiversity and Nature Conservation	
alongside transport networks will be increased. Furthermore, it is assumed that the duration of decommissioning activities under the RC storage option will be greater (due to the increased size of facility to be demolished and area of land to be restored) which will extent the duration of disturbance (e.g. – noise and dust) and consequently increase the potential for negatively effecting local flora and flora. That being said, it is unlikely that the increased scale of activities under the RC storage option will significantly alter the severity of effects on this objective.	

1.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the biodiversity objective. **Box 1.2** provides a summary of the options that have been assessed.

Box 1.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 1.2 are considered in-turn below.

Integrated Option Group 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems.	**- -/?**	**-**	**- -/?**	**<u>Potential Effects</u>** The Devonport and Rosyth dockyards are well established dockyards, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. No direct loss of protected or notable habitats as a result of SDP activities at the dockyards is therefore anticipated. Similarly, no effects on public access to areas of wildlife interest are anticipated, as the Devonport and Rosyth dockyards are not accessible to the public and do not contain any areas of wildlife interest. There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. It is expected that submarines will be wet towed into the dockyard. In the unlikely event that submarines are transported using a heavy left vessel, there is the potential for significant impacts on marine habitats and species, from any dredging or channel modifications *(refer to impacts specific to the Devonport and Rosyth dockyards).* Submarine transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility may indirectly impact on the marine environment and fisheries (e.g. disturbance of habitats and species or pollution from accidental spillage). Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on biodiversity, although the likelihood of such an event occurring is exceptionally small. There is potential for the transport of submarines to and from the Devonport and Rosyth dockyards and the commercial ship recycling facility to spread invasive species (flora or fauna) between waters. The likelihood of such an effect would depend on the presence of invasive species, which cannot be determined at this stage. Notwithstanding this, the probability of any such effect occurring is considered to be exceptional low. There is the potential for SDP activities within the Devonport and Rosyth dockyards to impact on the marine environment. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of significant effects on biodiversity during normal operations. However, there is the potential for impacts, e.g. accidental release of pollutants during construction such as silty run-off or spilled fuel and oils; and accidental release of pollutants and radioactive material during initial dismantling (RC cut out) and segregation/size reduction (full dismantling of the RC following interim storage) operations, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV. At both Devonport and Rosyth, there is the potential for indirect impacts on marine habitats and species, including internationally and nationally designated sites (*refer to impacts specific to the Devonport and Rosyth dockyards*). There could be the potential for transport movements associated with SDP activities (vehicle movements to and from site such as staff, plant equipment and deliveries, and transport of general waste, LLW and ILW off-site via road and/or rail) to impact on biodiversity, including noise and vibration disturbance from vehicle movements, the deposition of pollutants from vehicle exhausts, and accidental spill risk (e.g. fuel and oils).

Assessment Criteria	Score			Commentary
	1D	1R	1B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	**- -/?**	**-**	**- -/?**	However, no significant impacts are anticipated taking account of estimated transport movements, and that the potential for an accident or incident to occur is considered to be low. In the case of this option, ILW would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the RC, further reducing any potential impact on biodiversity associated with the transport of waste. Modifications to existing facilities at the Devonport and Rosyth dockyards and the construction of new facilities may indirectly impact on biodiversity through the supply chain. This could be through sourcing mineral, aggregates or timber resources from locations adjacent to important habitats or species. However, it is assumed that such activities will be permitted so such effects (if any) will be considered acceptable. As it is unknown at this stage where materials would be sourced, the potential for impacts cannot be determined at this stage. Design specifications for the dismantling and segregation/size reduction facilities are not available at this stage, although for the purposes of the assessment it is assumed that dismantling and segregation/size reduction facilities would not differ greatly between the options, albeit a crane with greater lifting capacity would be required for initial dismantling in the case of the RC option due to the weight of the RC. For all of the options it is assumed that ILW storage areas would need to be constructed, with storage of an RC expected to require the greatest surface area of the three technical options (an estimated 11,600m^2). Taking account of interim storage requirements, the scale of development required for the RC option would be greater than the other options and in consequence, the potential for any impact on marine biodiversity during construction could be greater. However, construction of SDP facilities would be phased, with initial construction comprising construction of facilities for dismantling and interim storage only. It is assumed that construction of facilities for segregating and size reduction of the RC would not take place until the interim storage period was nearing completion. Separating activities into two phases may help to keep levels of disturbance below threshold levels where they may become harmful to biodiversity, as ecosystems are more likely to be resilient to smaller disturbances. However, two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur. Although in the case of all of the technical options, as BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on biodiversity. The unplanned release of radioactive material associated with initial dismantling of the RC should not occur, as the radioactive material will be contained within the RC, is in solid form, will not be mobilised by initial dismanting and is a process subject to statutory ALARP principles. The RC option also allows for the in-situ decay of short lived isotopes, and in consequence, following interim storage radioactivity levels would have reduced resulting in the lowest dose estimates (of the three technical options). As the entire RC would be cut-out of the submarine, with the fore and aft sections subsequently requiring welding to seal them for transport, there could be greater potential for the release of non-radiological pollutants to the environment at this stage when compared to the other options which involve RPV removal from the RC with the RC to some extent acting as a shield and less severance of the submarine hull. The RC would need to be placed back into the DBV to remove the RPV, increasing the potential for accidental discharges into the basin when compared to the other technical options, which do not require use of the DBV following initial dismantling. The delay from interim storage before segregation/size reduction begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				point this is very uncertain.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	**- -/?**	**-**	**- -/?**	Devonport Dockyard The Plymouth Sound & Estuaries SAC is directly adjacent to Devonport dockyard. Its primary reasons for designation are the sandbank, estuary, inlet & bay, reef and Atlantic salt meadow habitats, some of which support extremely rich marine flora and fauna. Annex II species associated with the SAC include sea lamprey, river lamprey, Allis shad and twaite shad (all of which spawn in freshwater and are found in coastal waters, estuaries and rivers), along with dolphin, porpoise, otter and grey seal. The Tamar Estuaries Complex SPA and Ramsar site and St Johns Lake SSSI is located approx. 1.4km south-west of the dockyard. The SPA is primarily designated for its breeding populations of avocet and little egret. The SSSI is designated for its wintering wildfowl and wader populations and saltmarsh flora. In addition, Lynher Estuary SSSI is located approx. 2.7km west of the dockyard; designated for its extensive saltmarsh, which together with the adjacent mudflats provide important feeding and roosting grounds for large populations of wintering wildfowl and waders. Key issues for the Plymouth Sound & Estuaries SAC and the Tamar Estuaries Complex SPA and Ramsar site include increased pressure for moorings and associated facilities, port development, and oil pollution. The Tamar estuaries are sea trout and salmon rivers, with the fish passing through the estuary for the spring and autumn runs to the upriver spawning sites. These are largely between May to June and September to October, but fish are dependant on the river flows and will congregate in the estuary until the river conditions are suitable. Sea trout smolts come down through the estuary in April and May. Allis Shad migrate up the estuary to spawning grounds between March and June. It is understood that fish migrations do dictate the timings of certain activities in the estuary. Seabass are understood to be present in the estuary all year round, with the seabass nursery areas upstream of the dockyard in the saltmarsh/mudflat areas of the Lynher Estuary and elsewhere. There are fishes, particularly grey mullet, in the dockyard's basins but with the exception of the tidal 4 basin fish have limited opportunity to move to and from the estuary. Development along the estuary has restricted the available areas in the locality of the dockyard for bird populations, with only the mudflats off Torpoint and Wilcove supporting reasonable numbers of birds. Among these are godwits, particularly Black-tailed Godwit which is a relatively scarce species on the estuary. High tide roosts on pontoons and other structures attract birds from other parts of the estuary such as cormorant, oystercatcher, dunlin and turnstone in particular. Wadng birds frequent the mudflat on Weston Mill Creek to the north of the dockyard, where a small amount of saltmarsh vegetation is found. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	**- -/?**	**-**	**- -/?**	Previous studies have determined that polycyclic aromatic hydrocarbons (PAHs), principally from urban run-off, combustion and dockyard activities, are major contaminants in the lower part of the Tamar estuary. It is reported that dredged sediment from the estuary is toxic to mussels, and if highly resistant species such as mussels are being harmed by PAHs, then other animals in the ecosystem could also be adversely affected. There is evidence of a decline in animal health which may be related to increased mobilisation of PAH contaminated sediment by dredging, although there is insufficient data available to draw firm conclusions. Submarines are likely to be towed to Devonport dockyard for dismantling such that dredging is unliklely to be required. In the case of this option, following RC removal the two separated fore and aft hull sections would then require transportation to the commercial ship recycling facility. Submarines sections can be transported in a variety of ways

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				including heavy lift vessel, submersible barge or tow (following welding to ensure that they are watertight). Should fore and aft sections be transported by heavy left vessel (which is unlikely to be the preferred method) dredging may be required to create sufficient deep water (an estimated 300m wide area to a depth of 22-25+ metres would be required for heavy lift operations). The depth of water in those areas of Plymouth Sound that could be appropriate for heavy lift operations is estimated to be 15m. Taking account of this depth, dredging to 10m to create an area up to 25m deep and 300m wide would produce approx. 706,000 tonnes of dredged material. Sediment and bedrock depth is currently unknown. However, the depth to bedrock in Plymouth Sound has previously been reported as -39mOD. In the unlikely event that bedrock is encountered blasting would also need to be undertaken. At present, only very small amounts of maintenance dredging is undertaken at the dockyard each year. Maintenance dredging in the Lower Tamar is reported to account for the annual removal of 5,000 to 200,000 tonnes of sediment per year (based on tonnes of sediment dredged from the Tamar between 1985 and 2001). The dredging required for heavy lift operations would therefore be significant when compared to current dredging operations although it is considered unlikely that submarines will transported by heavy lift vessel. The dredging required to accommodate heavy lift operations has the potential to significantly impact on the marine environment and ecosystems due to the physical displacement of the bed of the estuary within the Plymouth Sound & Estuaries SAC, which could impact on marine habitat and species. In addition, any disposal of dredged material at sea could also impact on marine habitats and species. The removal of dredged sediment could result in the direct loss of benthic species and communities on the estuary bed. The displacement of sediment and disposal of dredged material could also increase the concentration of suspended solids and turbidity of the water, and mobilise organic matter, nutrients and/or contaminants such as PAHs depending on the nature of the material in the dredging area. The settlement of suspended sediments could also result in the smothering or blanketing of habitats and species, and depending on timings, fish migrations could also be affected. In addition, dredging could have indirect impacts on marine habitats and species by altering water quality, water currents and wave climates, and estuary morphology (e.g. alteration of sediment pathways and changes to siltation patterns. There is also the potential for SDP activities at Devonport dockyard to indirectly impact on the marine environment and ecosystems, including the designated nature conservation sites (Plymouth Sound & Estuaries SAC and St Johns Lake SSSI). The potential for adverse effects is considered to be minor as SDP activities would primarily be undertaken in facilities on the dockyard, with the exception of initial separationof the RC and subsequent segregation of the RC, which would take place in the DBV adjacent to the basin, and adoption of pollution prevention techniques would mitigate any risk. However, there could be the potential for significant adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water). As the dockyard basins connect to the estuary there is the potential for fish to access the basins, including several Annex II fish species (sea lamprey, river lamprey, allis shad and twaite shad) associated with the Plymouth Sound & Estuaries SAC. Depending on their presence within the basins, there could be the potential for submarine docking operations (flooding and subsequent dewatering of the dock) to have very minor effects on fish populations (e.g. disturbance and displacement). No direct impacts on bird populations, including those associated with the Tamar Estuaries Complex SPA and Ramsar site, St Johns Lake SSSI and Lynher Estuary SSSI are anticipated, assuming that SDP activities take place within the nuclear licensed site. If required, dredging and subsequent heavy lift operations within the estuary channel could, however, disturb local bird populations. There could also be the potential for indirect adverse impacts if a significant pollution incident occurred that adversely impacted upon the SPA and SSSI habitat. Devonport dockyard is downstream of the Lynher Estuary SSSI and if required heavy lift

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				operations would take place downstream of the dockyard, so the potential for SDP activities to impact on the SSSI habitat is considered unlikely unless a significant pollution incident occurred and pollutants were carried upstream by the tide.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	**- -/?**	**-**	**- -/?**	<u>Rosyth Dockyard</u> The Firth of Forth SPA (complex of estuarine and coastal habitats), Ramsar site and SSSI is located approx. 0.3km to the west of Rosyth dockyard at its closest point. The SPA and Ramsar site is primarily designated for its wintering populations of red-throated diver, slavonian grebe, golden plover and bar-tailed godwit and post-breeding population of sandwich tern. The SSSI is designated for its geology and ecology (birds and beetles). St Margaret's Marsh SSSI is also located approx. 0.5km to the south-east, which supports an extensive area of coastal reedbed and saltmarsh. It is noted that the Firth of Forth SPA is both upstream and downstream of the Rosyth dockyard, and the estuary is tidal. St Margaret's Marsh is located downstream of the dockyard. The major factor affecting the Forth of Firth SPA is coastal industrial development, although this is regulated. Localised tipping and commercial bait digging are also issues. Surveys carried out to inform the development of land to the east of Rosyth dockyard recorded over 50 species of bird in the area of Rosyth dockyard. The surveys identified 28 breeding bird species and 12 wintering bird species of conservation interest, although all were widespread species in the UK and none were recorded in significant numbers. Herring gull and redshank were recorded in the intertidal zone south of the dockyard, although only as one or two birds. Surveys carried out for the Forth Replacement Crossing documented few coastal birds near the Port of Rosyth, whereas more species and higher numbers were recorded in sectors east of the North Queensferry Railway Pier, including mudflats at Inverkeithling, as well as land 1.5km west of the Port of Rosyth. The Firth of Forth supports a diverse fish community, including resident, marine migrant, nursery-using and overwintering species, as well as those undertaking diadromous migrations (between freshwater and salt water). It acts as a migration route for river lamprey, sea lamprey, salmon and sea trout between coastal waters and their spawning areas. In addition, the smelt, an estuarine species of conservation concern, lives in the Firth of Forth. Other fish, such as flounder, move the estuary to feed, and it provides important nurseries for North Sea fish including herring, sand eel, sprat, cod, whiting, saithe, dab and plaice. It is understood from evidence collated for the Firth of Forth Replacement Crossing that both common and grey seals frequent the Firth of Forth throughout the year. JNCC maps show that harbour porpoise is present in or near the Firth of Forth most of the year and present in small groups (1-10 animals recorded per hour) in the Inner Firth of Forth during the months of March and August. Common and grey seal and harbour porpoise are not features of the SAC but Bottlenoise dolphin, minke whale and white-beaked dolphin also regularly visit the Firth of Forth, but are not frequent visitors west of the Forth Road Bridge. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any physical displacement of marine habitat or species (e.g. sandbanks). There is the potential for SDP activities at Rosyth dockyard to indirectly impact on the marine environment and ecosystems, including habitats associated with the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI. The potential for adverse effects is considered to be minor as SDP activities would primarily be undertaken in facilities on the dockyard, with the exception of initial separationof the RC and subsequent removal of the RPV from the RC, which would take place in the DBV adjacent to the basin, and adoption of pollution prevention techniques would mitigate any risk. However, there could be the

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				potential for significant adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel or oils into the water). As the dockyard basins connect to the estuary there is the potential for fish to access the basins. Depending on their presence within the basins, there could be the potential for submarine docking operations (flooding and subsequent dewatering of the dock) to have minor effects on fish populations (e.g. disturbance and displacement).
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	**- -/?**	**-**	**- -/?**	No direct impacts on bird populations, including those associated with the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI, are anticipated, assuming that SDP activities take place within the nuclear licensed site which is unlikely to support these bird populations. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards require comparable facilities for SDP activities, Devonport dockyard is less well equipped to undertake additional LLW processing. Further work would be required at Devonport dockyard to optimise the function of existing waste management facilities and the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option1D could therefore potentially have a greater impact on biodiversity as the range of construction activities would be greater, although no significant impacts on biodiversity from construction are anticipated. There is a greater potential for SDP activities at Devonport dockyard to impact on designated nature conservation sites, protected species and the structure and function of ecosystems. This is due to the proximity of the Plymouth Sound & Estuaries SAC adjacent to the dockyard, which comprises a number of Annex I marine habitats and Annex II species sensitive to waterside activities, port development and pollution. There is the potential for significant adverse impacts on the marine environment and ecosystems due to the physical displacement of the bed of the estuary within the Plymouth Sound & Estuaries SAC, if channel dredging is required to accommodate heavy lift operations (although it is expected that viable alternatives will be implemented ahead of heavy lift for the movement of submarines and fore and aft sections). Although SDP activities at Rosyth dockyard could also potentially impact on designated sites, as dredging to accommodate heavy lift operations is not required, the potential for effects on marine biodiversity are considered likely to be less. In the case of Option 1D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 1R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts on the marine environment associated with submarine transportation could therefore be greater for Option 1R, although no significant impacts on biodiversity from submarine transportation are anticipated. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Devonport dockyard to have a greater impact on biodiversity associated with the transport of waste when compared to Rosyth dockyard, although no significant impacts on biodiversity from the transport of waste are anticipated. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster dismantling of submarines, reducing the

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				potential for any impacts on biodiversity associated with the afloat storage of submarines, and reducing the timescale of any potential impacts associated with SDP activities. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be de-fuelled. However, because the dual option could require the fore and aft sections of the processed submarine to be transported to a ship recycling facility by heavy lift ship, dredging could be required of the Sound to accommodate the loading of the ship. As a consequence the dual option scores similarly to 1D. Overall, scale of potential effect of Option 1B could be less than that of Option 1D, as SDP activities would take place at both dockyards and therefore the timescale of any impact or disturbance would be less.

Integrated Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems.	-	0/-	-	**<u>Potential Effects</u>** The Devonport and Rosyth dockyards are well established dockyards, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. No direct loss of protected or notable habitats as a result of SDP activities at the dockyards is therefore anticipated. Similarly, no effects on public access to areas of wildlife interest are anticipated, as the Devonport and Rosyth dockyards are not accessible to the public and do not contain any areas of wildlife interest. There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. It is expected that submarines will be wet towed into the dockyard. Submarine transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility may indirectly impact on the marine environment and fisheries (e.g. disturbance of habitats and species or pollution from accidental spillage). Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on biodiversity, although the likelihood of such an event occurring is exceptionally small. There is potential for the transport of submarines to and from the Devonport and Rosyth dockyards and the ship recycling facility to spread invasive species (flora or fauna) between waters. The likelihood of such an effect would depend on the presence of invasive species, which cannot be determined at this stage. Notwithstanding this, the probability of any such effect occurring is considered to be very low. There is the potential for SDP activities within the Devonport and Rosyth dockyards to impact on the marine environment and ecosystem. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of significant effects on biodiversity during normal operations. However, there is the potential for impacts, e.g. accidental release of pollutants during construction such as silty run-off or spilled fuel and oils; and accidental release of pollutants and radioactive material during dismantling (RPV removal operations) and segregation/size reduction (full dismantling of the RPV following interim storage) operations, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV. At both Devonport and Rosyth, there is the potential for indirect impacts on marine habitats and species, including internationally and nationally designated sites (*refer to impacts specific to the Devonport and Rosyth dockyards*). There could be the potential for transport movements associated with SDP activities (vehicle movements to and from site such as staff, plant equipment and deliveries, and transport of general waste, LLW and ILW off-site via road and/or rail) to impact on biodiversity, including noise and vibration disturbance from vehicle movements, the deposition of pollutants from vehicle exhausts, and accidental spill risk (e.g. fuel and oils).

Assessment Criteria	Score			Commentary
	2D	2R	2B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-	0/-	-	However, no significant impacts are anticipated taking account of estimated transport movements, and that the potential for an accident or incident to occur is considered to be low. In the case of this option, ILW would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the RPV, further reducing any potential impact on biodiversity associated with the transport of waste. Modifications to existing facilities at the Devonport and Rosyth dockyards and the construction of new facilities may indirectly impact on biodiversity through the supply chain. This could be through sourcing mineral, aggregates or timber resources from locations adjacent to important habitats or species. However, it is assumed that such activities will be permitted so such effects (if any) will be considered acceptable. As it is unknown where materials would be sourced, the potential for impacts cannot be determined at this stage. Design specifications for the dismantling and segregation/size reduction facilities are not available at this stage, although for the purposes of the assessment it is assumed that dismantling and segregation/size reduction facilities would not differ greatly between the options. For all of the options it is assumed that interim storage areas would need to be constructed, with storage of an RPV expected to require the smallest footprint of the three technical options (an estimated 801m^2). Taking account of interim storage requirements, the scale of development required for the RPV option would be smaller than the other options, and in consequence this option could have the least impact on marine biodiversity during construction. In addition, in the case of the RPV option, construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). It is assumed that construction of facilities for segregation and size reduction of the RPV would not take place until the interim storage period was nearing completion. Separating activities into two phases may help to keep levels of disturbance below threshold levels where they may become harmful to biodiversity, as ecosystems and species are more likely to be resilient to smaller disturbances. However, two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur. Although in the case of all of the technical options, as BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on biodiversity. The likelihood of an unplanned release of radioactive material associated with initial dismantling is exceptionally low but slightly higher than for the RC option as the RPV would be removed from the reactor compartment in the case of this option. There is lower potential for the release of non-radiological pollutants to the environment at this stage when compared to the RC option as the RC would to some extent act as a shield during RPV removal and and the submarine hull would largely remain intact. Similar to the RC option, the RPV option is considered to carry very little dose, as the RPV option allows for the in-situ decay of short lived isotopes and ALARP principles would necessitate the use of radiologically shielded 'hot cells' when the metal of the RPV is being cut apart. In addition, following interim storage the RPV would not need to be placed back into the DBV prior to segregation, thus reducing the potential for accidental discharge into the basin when compared to the RC option, which requires use of the DBV following initial dismantling. The delay from interim storage before size reduction begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-	0/-	-	<u>Devonport Dockyard</u> The Plymouth Sound & Estuaries SAC is directly adjacent to Devonport dockyard. Its primary reasons for designation are the sandbank, estuary, inlet & bay, reef and Atlantic salt meadow habitats, some of which support extremely rich marine flora and fauna. Annex II species associated with the SAC include sea lamprey, river lamprey, Allis shad and twaite shad (all of which spawn in freshwater and are found in coastal waters, estuaries and rivers), along with dolphin, porpoise, otter and grey seal. The Tamar Estuaries Complex SPA and Ramsar site and St Johns Lake SSSI is also located approx. 1.4km south-west of the dockyard. The SPA is primarily designated for its breeding populations of avocet and little egret. The SSSI is designated for its wintering wildfowl and wader populations and saltmarsh flora. In addition, Lynher Estuary SSSI is located approx. 2.7km west of the dockyard; designated for its extensive saltmarsh, which together with the adjacent mudflats provide important feeding and roosting grounds for large populations of wintering wildfowl and waders. Key issues for the Plymouth Sound & Estuaries SAC and the Tamar Estuaries Complex SPA and Ramsar site include increased pressure for moorings and associated facilities, port development, and oil pollution. The Tamar estuaries are sea trout and salmon rivers, with the fish passing through the estuary for the spring and autumn runs to the upriver spawning sites. These are largely between May to June and September to October, but fish are dependant on the river flows and will congregate in the estuary until the river conditions are suitable. Sea trout smolts come down through the estuary in April and May. Allis Shad migrate up the estuary to spawning grounds between March and June. It is understood that fish migrations do dictate the timings of certain activities in the estuary. Seabass are understood to be present in the estuary all year round, with the seabass nursery areas upstream of the dockyard in the saltmarsh/mudflat areas of the Lynher Estuary and elsewhere. There are fishes, particularly grey mullet, in the dockyard's basins but with the exception of the tidal 4 basin fish have limited opportunity to move to and from the estuary. Development along the estuary has restricted the available areas in the locality of the dockyard for bird populations, with only the mudflats off Torpoint and Wilcove supporting reasonable numbers of birds. Among these are godwits, particularly Black-tailed Godwit which is a relatively scarce species on the estuary. High tide roosts on pontoons and other structures attract birds from other parts of the estuary such as cormorant, oystercatcher, dunlin and turnstone in particular. Wadng birds frequent the mudflat on Weston Mill Creek to the north of the dockyard, where a small amount of saltmarsh vegetation is found. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation. Towing does not require any dredging.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-	0/-	-	Previous studies have determined that PAHs, principally from urban run-off, combustion and dockyard activities, are major contaminants in the lower part of the Tamar estuary. It is reported that dredged sediment from the estuary is toxic to mussels, and if highly resistant species such as mussels are being harmed by PAHs, then other animals in the ecosystem could also be adversely affected. There is evidence of a decline in animal health which may be related to increased mobilisation of PAH contaminated sediment by dredging, although there is insufficient data available to draw firm conclusions. There is also the potential for SDP activities at Devonport dockyard to indirectly impact on the marine environment and ecosystems, including the designated nature conservation sites (Plymouth Sound & Estuaries SAC and St Johns Lake SSSI). The potential for adverse effects is considered to be minor as SDP activities would primarily be undertaken in facilities on the dockyard, with the exception of the removal of the RPV from the RC, which would take place in the DBV adjacent to the basin, and adoption of pollution prevention techniques would mitigate any risk. However, there could be the potential for significant adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel or oils into

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				the water). As the dockyard basins connect to the estuary there is the potential for fish to access the basins, including several Annex II fish species (sea lamprey, river lamprey, allis shad and twaite shad) associated with the Plymouth Sound & Estuaries SAC. Depending on their presence within the basins, there could be the potential for submarine docking operations (flooding and subsequent dewatering of the dock) to have very minor effects on fish populations (e.g. disturbance and displacement). No direct impacts on bird populations, including those associated with the Tamar Estuaries Complex SPA and Ramsar site, St Johns Lake SSSI and Lynher Estuary SSSI are anticipated, assuming that SDP activities take place within the nuclear licensed site. There could be the potential for indirect adverse impacts if a significant pollution incident occurred that adversely impacted upon the SPA and SSSI habitat. Devonport dockyard is downstream of the Lynher Estuary SSSI and so the potential for SDP activities to impact on the SSSI habitat is considered unlikely unless a significant pollution incident occurred and pollutants were carried upstream by the tide.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-	0/-	-	<u>Rosyth Dockyard</u> The Firth of Forth SPA (complex of estuarine and coastal habitats), Ramsar site and SSSI is located approx. 0.3km to the west of Rosyth dockyard at its closest point. The SPA and Ramsar site is primarily designated for its wintering populations of red-throated diver, slavonian grebe, golden plover and bar-tailed godwit and post-breeding population of sandwich tern. The SSSI is designated for its geology and ecology (bird and beetle populations). St Margaret's Marsh SSSI is also located approx. 0.5km to the south-east, which supports an extensive area of coastal reedbed and saltmarsh. It is noted that the Firth of Forth SPA is both upstream and downstream of the Rosyth dockyard, and the estuary is tidal. St Margaret's Marsh is located downstream of the dockyard. The major factor affecting the Forth of Firth SPA is coastal industrial development, although this is regulated. Localised tipping and commercial bait digging are also issues. Surveys carried out to inform the development of land to the east of Rosyth dockyard recorded over 50 species of bird in the area of Rosyth dockyard. The surveys identified 28 breeding bird species and 12 wintering bird species of conservation interest, although all were widespread species in the UK and none were recorded in significant numbers. Herring gull and redshank were recorded in the intertidal zone south of the dockyard, although only as one or two birds. Surveys carried out for the Forth Replacement Crossing documented few coastal birds near the Port of Rosyth, whereas more species and higher numbers were recorded in sectors east of the North Queensferry Railway Pier, including mudflats at Inverkeithling, as well as land over 1.5km west of the Port of Rosyth. The Firth of Forth supports a diverse fish community, including resident, marine migrant, nursery-using and overwintering species, as well as those undertaking diadromous migrations (between freshwater and salt water). It acts as a migration route for river lamprey, sea lamprey, salmon and sea trout between coastal waters and their spawning areas. In addition, the smelt, an estuarine species of conservation concern, lives in the Firth of Forth. Other fish, such as flounder, move the estuary to feed, and it provides important nurseries for North Sea fish including herring, sand eel, sprat, cod, whiting, saithe, dab and plaice. It is understood from evidence collated for the Firth of Forth Replacement Crossing that both common and grey seals frequent the Firth of Forth throughout the year. JNCC maps show that harbour porpoise is present in or near the Firth of Forth most of the year and present in small groups (1-10 animals recorded per hour) in the Inner Firth of Forth during the months of March and August. Common and grey seal and harbour porpoise are not features of the SAC but Bottlenoise dolphin, minke whale and white-beaked dolphin also regularly visit the Firth of Forth, but are not frequent visitors west of the Forth Road Bridge. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any physical displacement of marine habitat or species (e.g. sandbanks). There is the potential for SDP activities at Rosyth dockyard to indirectly impact on the marine environment and ecosystems, including habitats associated with the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI. The potential for adverse effects is considered to be minor as SDP activities would primarily be undertaken in facilities on the dockyard, with the exception of the removal of the RPV from the RC, which would take place in the DBV adjacent to the basin, and adoption of pollution prevention techniques would mitigate any risk. However, there could be the potential for significant adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water). As the dockyard basins connect to the estuary there is the potential for fish to access the basins. Depending on their presence within the basins, there could be the potential for submarine docking operations (flooding and subsequent dewatering of the dock) to have minor effects on fish populations (e.g. disturbance and displacement).
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-	0/-	-	No direct impacts on bird populations, including those associated with the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI, are anticipated, assuming that SDP activities take place within the nuclear licensed site which is unlikely to support these bird populations. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 2D could therefore potentially have a greater impact on biodiversity as the range of construction activities would be greater, although no significant impacts on biodiversity from construction are anticipated. There is a greater potential for SDP activities at Devonport dockyard to impact on designated nature conservation sites, protected species and the structure and function of ecosystems. This is due to the proximity of the Plymouth Sound & Estuaries SAC adjacent to the dockyard, which comprises a number of Annex I marine habitats and Annex II species sensitive to waterside activities, port development and pollution. Although SDP activities at Rosyth dockyard could also potentially impact on designated sites, the potential for effects on marine biodiversity are considered likely to be less. In the case of Option 2D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 2R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts on the marine environment associated with submarine transportation could therefore be greater for Option 2R, although no significant impacts on biodiversity from submarine transportation are anticipated. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Devonport dockyard to have a greater impact on biodiversity associated with the transport of waste when compared to Rosyth dockyard, although no significant impacts on biodiversity from the transport of waste are anticipated. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				noted that utilising both sites would enable faster dismantling of submarines, reducing the potential for any impacts on biodiversity associated with the afloat storage of submarines, and reducing the timescale of any potential impacts associated with SDP activities. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be de-fuelled. Overall, scale of potential effect of Option 2B could be less than that of Option 2D, as SDP activities would take place at both dockyards and therefore the timescale of any impact or disturbance would be less.

Options 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems.	-/?	-/?	-/?	**Potential Effects** The Devonport and Rosyth dockyards are well established dockyards, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. No direct loss of protected or notable habitats as a result of dismantling activities at the dockyards is therefore anticipated. Similarly, no effects on public access to areas of wildlife interest are anticipated as a result of dismantling activities, as the Devonport and Rosyth dockyards are not accessible to the public and do not contain any areas of wildlife interest. There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. It is expected that submarines will be wet towed into the dockyard. Submarine transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility may indirectly impact on the marine environment and fisheries (e.g. disturbance of habitats and species or pollution from accidental spillage). Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on biodiversity, although the likelihood of such an event occurring is exceptionally small. There is the potential for the transport of submarines to and from the Devonport and Rosyth dockyards and the ship recycling facility to spread invasive species (flora and fauna) between waters. The likelihood of such an effect would depend on the presence of invasive species, which cannot be determined at this stage. Notwithstanding this, the probability of any such effect occurring is considered to be very low. There is the potential for dismantling activities to impact on the marine environment and ecosystem. However, dismantling activities would be closely regulated and subject to stringent environmental permitting requirements. Use of BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of significant effects on biodiversity during normal dismantling operations. However, there is the potential for impacts, e.g. accidental release of pollutants during construction such as silty run-off or spilled fuel and oils; and accidental release of pollutants and radioactive material during RPV removal, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV. At both Devonport and Rosyth, there is the potential for indirect impacts on marine habitats and species, including internationally and nationally designated sites (*refer to impacts specific to the Devonport and Rosyth dockyards*). In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation/size reduction (full dismantling of the RPV following interim storage). It is unknown whether an existing storage facility would be available for use, or whether a new facility would need to be constructed. Depending on the biodiversity value of the site and its surrounds, construction of interim storage and segregation/size reduction facilities (if required) could have an impact on habitats, species and ecosystems, e.g. direct habitat loss or fragmentation due to development, disturbance and changes in character due to alterations in drainage patterns and deposition of pollutants.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/?	-/?	Depending on the remote site location there could be the potential for impacts on statutory and non-statutory designated sites and other protected and notable habitats and species. There could also be the potential for interim storage and segregation/size reduction activities to affect public access to areas of wildlife interest, depending on the nature of the remote site and any access restrictions. At this stage a remote site has not been identified and subsequently the effect of interim storage and segregation/size reduction activities on biodiversity is uncertain. There could be the potential for transport movements associated with SDP activities, e.g. vehicle movements to and from the dismantling site and remote site such as staff, plant equipment and deliveries, and wastes; transport of the RPVs from the dismantling site to the remote site; and transport of ILW and LLW off the remote site via road and/or rail to impact on biodiversity, including noise and vibration disturbance from vehicle movements, the deposition of pollutants from vehicle exhausts, and accidental spill risk (e.g. fuel and oils). However, no significant impacts are anticipated taking account of estimated transport movements, and that the potential for an accident or incident to occur is considered to be low. Modifications to existing facilities and the construction of new facilities at the Devonport and Rosyth dockyards and the remote site as required may indirectly impact on biodiversity through the supply chain. This could be through sourcing mineral, aggregates or timber resources from locations adjacent to important habitats or species. However, it is assumed that such activities will be permitted so such effects (if any) will be considered acceptable. As it is unknown at this stage where materials would be sourced, the potential for impacts cannot be determined at this stage. Design specifications for the dismantling and segregation /size reduction facilities are not available at this stage, although for the purposes of the assessment it is assumed that dismantling and segregation/size reduction facilities would not differ greatly between the options. For all of the options it is assumed that interim storage areas would need to be constructed, with storage of an RPV expected to require the smallest surface area of the three technical options (an estimated 801m^2). Taking account of interim storage requirements, the scale of development required for the RPV option would be smaller than the other options, and in consequence this option could have the least impact on marine biodiversity during construction. In addition, in the case of the RPV option, construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). It is assumed that construction of facilities for segregation and size reduction of the RPV would not take place until the interim storage period was nearing completion. Separating activities into two phases may help to keep levels of disturbance below threshold levels where they may become harmful to biodiversity, as ecosystems and species are more likely to be resilient to smaller disturbances. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur. In the case of this option, construction would also take place on two different sites. Although in the case of all of the technical options, as BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on biodiversity. The likelihood of an unplanned release of radioactive material associated with initial dismantling is exceptionally low but slightly higher than for the RC option as the RPV would be removed from the reactor compartment in the case of this option. There is lower potential for the release of non-radiological pollutants to the environment at this stage when compared to the RC option as the RC would to some extent act as a shield during RPV removal and the submarine hull would largely remain intact. Similar to the RC option the RPV option is considered to be less of a pollution risk in the short term than the PW option, as the RPV option allows for the in-situ decay of short lived ILW. Following interim storage, radioactivity levels would have reduced due to the decay of the short lived isotopes, resulting in a reduction in potential sources of radiological discharge. In addition, following interim storage the RPV would not need to be placed back

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				into the DBV prior to segregation, thus reducing the potential for accidental discharge into the basin when compared to the RC option, which requires use of the DBV following initial dismantling. The delay from interim storage before segregation begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/?	-/?	<u>Devonport Dockyard</u> The Plymouth Sound & Estuaries SAC is directly adjacent to Devonport dockyard. Its primary reasons for designation are the sandbank, estuary, inlet & bay, reef and Atlantic salt meadow habitats, some of which support extremely rich marine flora and fauna. Annex II species associated with the SAC include sea lamprey, river lamprey, Allis shad and twaite shad (all of which spawn in freshwater and are found in coastal waters, estuaries and rivers), along with dolphin, porpoise, otter and grey seal. The Tamar Estuaries Complex SPA and Ramsar site and St Johns Lake SSSI is also located approx. 1.4km south-west of the dockyard. The SPA is primarily designated for its breeding populations of avocet and little egret. The SSSI is designated for its wintering wildfowl and wader populations and saltmarsh flora. In addition, Lynher Estuary SSSI is located approx. 2.7km west of the dockyard; designated for its extensive saltmarsh, which together with the adjacent mudflats provide important feeding and roosting grounds for large populations of wintering wildfowl and waders. Key issues for the Plymouth Sound & Estuaries SAC and the Tamar Estuaries Complex SPA and Ramsar site include increased pressure for moorings and associated facilities, port development, and oil pollution. The Tamar estuaries are sea trout and salmon rivers, with the fish passing through the estuary for the spring and autumn runs to the upriver spawning sites. These are largely between May to June and September to October, but fish are dependant on the river flows and will congregate in the estuary until the river conditions are suitable. Sea trout smolts come down through the estuary in April and May. Allis Shad migrate up the estuary to spawning grounds between March and June. It is understood that fish migrations do dictate the timings of certain activities in the estuary. Seabass are understood to be present in the estuary all year round, with the seabass nursery areas upstream of the dockyard in the saltmarsh/mudflat areas of the Lynher Estuary and elsewhere. There are fishes, particularly grey mullet, in the dockyard's basins but with the exception of the tidal 4 basin fish have limited opportunity to move to and from the estuary. Development along the estuary has restricted the available areas in the locality of the dockyard for bird populations, with only the mudflats off Torpoint and Wilcove supporting reasonable numbers of birds. Among these are godwits, particularly Black-tailed Godwit which is a relatively scarce species on the estuary. High tide roosts on pontoons and other structures attract birds from other parts of the estuary such as cormorant, oystercatcher, dunlin and turnstone in particular. Wadng birds frequent the mudflat on Weston Mill Creek to the north of the dockyard, where a small amount of saltmarsh vegetation is found.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/?	-/?	Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation. Previous studies have determined that PAHs, principally from urban run-off, combustion and dockyard activities, are major contaminants in the lower part of the Tamar estuary. It is reported that dredged sediment from the estuary is toxic to mussels, and if highly resistant species such as mussels are being harmed by PAHs, then other animals in the ecosystem could also be adversely affected. There is evidence of a decline in animal health which may be related to increased mobilisation of PAH contaminated sediment by dredging, although there is insufficient data available to draw firm conclusions. There is also the potential for dismantling activities at Devonport dockyard to indirectly impact on the marine environment and ecosystems, including the designated nature conservation sites (Plymouth Sound & Estuaries SAC and St Johns Lake SSSI). The potential for adverse effects is considered to be minor as the adoption of pollution prevention techniques would mitigate any risk. However, there could be the potential for significant adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water). As the dockyard basins connect to the estuary there is the potential for fish to access the basins, including several Annex II fish species (sea lamprey, river lamprey, allis shad and twaite shad) associated with the Plymouth Sound & Estuaries SAC. Depending on their presence within the basins, there could be the potential for submarine docking operations (flooding and subsequent dewatering of the dock) to have very minor effects on fish populations (e.g. disturbance and displacement).
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/?	-/?	No direct impacts on bird populations, including those associated with the Tamar Estuaries Complex SPA and Ramsar site, St Johns Lake SSSI and Lynher Estuary SSSI are anticipated, assuming that SDP activities take place within the nuclear licensed site. There could be the potential for indirect adverse impacts if a significant pollution incident occurred that adversely impacted upon the SPA and SSSI habitat. Devonport dockyard is downstream of the Lynher Estuary SSSI and if required heavy lift operations would take place downstream of the dockyard, so the potential for dismantling activities to impact on the SSSI habitat is considered unlikely unless a significant pollution incident occurred and pollutants were carried upstream by the tide. <u>Rosyth Dockyard</u> The Firth of Forth SPA (complex of estuarine and coastal habitats), Ramsar site and SSSI is located approx. 0.3km to the west of Rosyth dockyard at its closest point. The SPA and Ramsar site is primarily designated for its wintering populations of red-throated diver, slavonian grebe, golden plover and bar-tailed godwit and post-breeding population of sandwich tern. The SSSI is designated for its geology and ecology (bird and beetles). St Margaret's Marsh SSSI is also located approx. 0.5km to the south-east, which supports an extensive area of coastal reedbed and saltmarsh. It is noted that the Firth of Forth SPA is both upstream and downstream of the Rosyth dockyard, and the estuary is tidal. St Margaret's Marsh is located downstream of the dockyard. The major factor affecting the Forth of Firth SPA is coastal industrial development, although this is regulated. Localised tipping and commercial bait digging are also issues. Surveys carried out to inform the development of land to the east of Rosyth dockyard recorded over 50 species of bird in the area of Rosyth dockyard. The surveys identified 28 breeding bird species and 12 wintering bird species of conservation interest, although all were widespread species in the UK and none were recorded in significant numbers. Herring gull and redshank were recorded in the intertidal zone south of the dockyard, although only as one or two birds. Surveys carried out for the Forth Replacement Crossing documented few coastal birds near the Port of Rosyth, whereas more species and higher numbers were recorded in sectors east of the North Queensferry Railway Pier, including mudflats at Inverkeithling, as well as land over 1.5km west of the Port of Rosyth. The Firth of Forth supports a diverse fish community, including resident, marine migrant,

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				nursery-using and overwintering species, as well as those undertaking diadromous migrations (between freshwater and salt water). It acts as a migration route for river lamprey, sea lamprey, salmon and sea trout between coastal waters and their spawning areas. In addition, the smelt, an estuarine species of conservation concern, lives in the Firth of Forth. Other fish, such as flounder, move the estuary to feed, and it provides important nurseries for North Sea fish including herring, sand eel, sprat, cod, whiting, saithe, dab and plaice. It is understood from evidence collated for the Firth of Forth Replacement Crossing that both common and grey seals frequent the Firth of Forth throughout the year. JNCC maps show that harbour porpoise is present in or near the Firth of Forth most of the year and present in small groups (1-10 animals recorded per hour) in the Inner Firth of Forth during the months of March and August. Common and grey seal and harbour porpoise are not features of the SAC but Bottlenoise dolphin, minke whale and white-beaked dolphin also regularly visit the Firth of Forth, but are not frequent visitors west of the Forth Road Bridge. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any physical displacement of marine habitat or species (e.g. sandbanks).
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/?	-/?	There is the potential for dismantling activities at Rosyth dockyard to indirectly impact on the marine environment and ecosystems, including habitats associated with the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI. The potential for adverse effects is considered to be minor as the adoption of pollution prevention techniques would mitigate any risk. However, there could be the potential for significant adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water). No direct impacts on bird populations, including those associated with the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI, are anticipated, assuming that dismantling activities take place within the nuclear licensed site which is unlikely to support these bird populations. As the dockyard basins connect to the estuary there is the potential for fish to access the basins. Depending on their presence within the basins, there could be the potential for submarine docking operations (flooding and subsequent dewatering of the dock) to have minor effects on fish populations (e.g. disturbance and displacement). **<u>Comparison of the Options</u>** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. There is a greater potential for construction and dismantling activities at Devonport dockyard to impact on designated nature conservation sites, protected species and the structure and function of ecosystems. This is due to the proximity of the Plymouth Sound & Estuaries SAC adjacent to the dockyard, which comprises a number of Annex I marine habitats and Annex II species sensitive to waterside activities, port development and pollution. Although dismantling activities at Rosyth dockyard could also potentially impact on designated sites, the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI, taking account of the location, nature and sensitivity of the habitats, the potential for adverse impacts is considered to be greater at Devonport dockyard. In the case of Option 3/4D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 3/4R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts on the marine environment associated with submarine transportation could therefore be greater for Option 3/4R, although no significant impacts on biodiversity

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				from submarine transportation are anticipated At this stage a remote site for interim storage and segregation/size reduction has not been identified and subsequently the potential effect of these activities on biodiversity is uncertain. The potential for effects would depend on the location of the remote site, the biodiversity value of the site and its surrounds, the sensitivity of habitats/species present, and the level of habitat disturbance or loss. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised for dismantling activities, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster dismantling of submarines, reducing the timescale of any potential impacts associated with SDP activities.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/?	-/?	In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be de-fuelled. Overall, scale of potential effect of Option 3/4B could be less than that of Option 3/4D, as SDP activities would take place at both dockyards and therefore the timescale of any impact or disturbance would be less.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems.	-	0/-	-	**Potential Effects** The Devonport and Rosyth dockyards are well established dockyards, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. No direct loss of protected or notable habitats as a result of SDP activities at the dockyards is therefore anticipated. Similarly, no effects on public access to areas of wildlife interest are anticipated, as the Devonport and Rosyth dockyards are not accessible to the public and do not contain any areas of wildlife interest. There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. It is expected that submarines will be wet towed into the dockyard. Submarine transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility may indirectly impact on the marine environment and fisheries (e.g. disturbance of habitats and species or pollution from accidental spillage). Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on biodiversity, although the likelihood of such an event occurring is exceptionally small. There is the potential for the transport of submarines to and from the Devonport and Rosyth dockyards and the ship recycling facility to spread invasive species (flora and fauna) between waters. The likelihood of such an effect would depend on the presence of invasive species, which cannot be determined at this stage. Notwithstanding this, the probability of any such effect occurring is considered to be exceptionally low. There is the potential for SDP activities within the dockyards to impact on the marine environment and ecosystem. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of significant effects on biodiversity during normal operations. However, there is the potential for impacts, e.g. accidental release of pollutants during construction such as silty run-off or spilled fuel and oils; and accidental release of pollutants and radioactive material during initial dismantling (RPV removal) and segregation/size reduction (full dismantling of the RPV) operations, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV. At both Devonport and Rosyth, there is the potential for indirect impacts on marine habitats and species, including internationally and nationally designated sites (*refer to impacts specific to the Devonport and Rosyth dockyards*). There could be the potential for transport movements associated with SDP activities (vehicle movements to and from site such as staff, plant equipment and deliveries, and transport of general waste, LLW and ILW off-site via road and/or rail) to impact on biodiversity, including noise and vibration disturbance from vehicle movements, the deposition of pollutants from vehicle exhausts, and accidental spill risk (e.g. fuel and oils).
A. Biodiversity and Nature Conservation	-	0/-	-	However, no significant impacts are anticipated taking account of estimated transport movements, and that the potential for an accident or incident to occur is considered to be low. In the case of this option, the PW would be stored at the point of waste generation and

Assessment Criteria	Score			Commentary
	5D	5R	5B	
Protect and enhance habitats, species and ecosystems. *(continued)*				therefore the only transportation required for interim storage would be the on-site transfer of the PW, further reducing any potential impact on biodiversity associated with the transport of waste. Modifications to existing facilities at the Devonport and Rosyth dockyards and the construction of new facilities may indirectly impact on biodiversity through the supply chain. This could be through sourcing mineral, aggregates or timber resources from locations adjacent to important habitats or species. However, it is assumed that such activities will be permitted so such effects (if any) will be considered acceptable. As it is unknown at this stage where materials would be sourced, the potential for impacts cannot be determined at this stage. Design specifications for the dismantling and segregation/size reduction facilities are not available at this stage, although for the purposes of the assessment it is assumed that dismantling and segregation/size reduction facilities would not differ greatly between the options. For all of the options it is assumed that interim storage areas would need to be constructed, with storage of PW expected to require 1,005m^2. Taking account of interim storage requirements, the scale of development required would be greater than the RPV option but smaller than the RC option, and in consequence, the potential for any impact on marine biodiversity during construction for the PW option could be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full segregation and size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on biodiversity from SDP activities as levels of activity and disturbance would be greater. Notwithstanding this, construction would take place on two different sites, reducing any impacts on biodiversity from SDP activities as the scale of activity undertaken at the respective sites would be less. Although in the case of all of the technical options, as BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on biodiversity. The PW option is considered to carry a very small risk (but slightly higher than either RC or RPV options) of unplanned release of radioactive material associated with dismantling, as the RPV would be removed from the RC and would be fully dismantled 'immediately'. The in-situ decay of short lived isotopes will not have occurred to the same extent as for the RC or RPV options and in consequence, this option involves management of material with higher levels of activity. Neverthless, the risk of unplanned radiological exposure is considered to be low because of the statutory safety requirements that are in place. There is considered to be less potential for the release of non-radiological pollutants to the environment during initial dismantling (RPV removal) when compared to the RC option as the RC would to some extent act as a shield during RPV removal and and the submarine hull would largely remain intact. <u>Devonport Dockyard</u> The Plymouth Sound & Estuaries SAC is directly adjacent to Devonport dockyard. Its primary reasons for designation are the sandbank, estuary, inlet & bay, reef and Atlantic salt meadow habitats, some of which support extremely rich marine flora and fauna. Annex II species associated with the SAC include sea lamprey, river lamprey, Allis shad and twaite shad (all of which spawn in freshwater and are found in coastal waters, estuaries and rivers), along with dolphin, porpoise, otter and grey seal. The Tamar Estuaries Complex SPA and Ramsar site and St Johns Lake SSSI is also located approx. 1.4km south-west of the dockyard. The SPA is primarily designated for its breeding populations of avocet and little egret. The SSSI is designated for its wintering wildfowl and wader populations and saltmarsh flora. In addition, Lynher Estuary SSSI is located approx. 2.7km west of the dockyard; designated for its extensive saltmarsh, which together with the adjacent mudflats provide important feeding and roosting grounds for large populations of wintering wildfowl and waders. Key issues for the Plymouth Sound & Estuaries SAC and the Tamar Estuaries Complex SPA and Ramsar site include increased pressure for moorings and associated facilities, port development, and oil pollution.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-	0/-	-	The Tamar estuaries are sea trout and salmon rivers, with the fish passing through the estuary for the spring and autumn runs to the upriver spawning sites. These are largely between May to June and September to October, but fish are dependant on the river flows and will congregate in the estuary until the river conditions are suitable. Sea trout smolts come down through the estuary in April and May. Allis Shad migrate up the estuary to spawning grounds between March and June. It is understood that fish migrations do dictate the timings of certain activities in the estuary. Seabass are understood to be present in the estuary all year round, with the seabass nursery areas upstream of the dockyard in the saltmarsh/mudflat areas of the Lynher Estuary and elsewhere. There are fishes, particularly grey mullet, in the dockyard's basins but with the exception of the tidal 4 basin fish have limited opportunity to move to and from the estuary. Development along the estuary has restricted the available areas in the locality of the dockyard for bird populations, with only the mudflats off Torpoint and Wilcove supporting reasonable numbers of birds. Among these are godwits, particularly Black-tailed Godwit which is a relatively scarce species on the estuary. High tide roosts on pontoons and other structures attract birds from other parts of the estuary such as cormorant, oystercatcher, dunlin and turnstone in particular. Wadng birds frequent the mudflat on Weston Mill Creek to the north of the dockyard, where a small amount of saltmarsh vegetation is found. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation. Previous studies have determined that PAHs, principally from urban run-off, combustion and dockyard activities, are major contaminants in the lower part of the Tamar estuary. It is reported that dredged sediment from the estuary is toxic to mussels, and if highly resistant species such as mussels are being harmed by PAHs, then other animals in the ecosystem could also be adversely affected. There is evidence of a decline in animal health which may be related to increased mobilisation of PAH contaminated sediment by dredging, although there is insufficient data available to draw firm conclusions.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-	0/-	-	There is also the potential for SDP activities at Devonport dockyard to indirectly impact on the marine environment and ecosystems, including the designated nature conservation sites (Plymouth Sound & Estuaries SAC and St Johns Lake SSSI). The potential for adverse effects is considered to be minor as SDP activities would primarily be undertaken in facilities on the dockyard, with the exception of the removal of the RPV from the RC, which would take place in the DBV adjacent to the basin, and adoption of pollution prevention techniques would mitigate any risk. However, there could be the potential for significant adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water). As the dockyard basins connect to the estuary there is the potential for fish to access the basins, including several Annex II fish species (sea lamprey, river lamprey, allis shad and twaite shad) associated with the Plymouth Sound & Estuaries SAC. Depending on their presence within the basins, there could be the potential for submarine docking operations (flooding and subsequent dewatering of the dock) to have very minor effects on fish populations (e.g. disturbance and displacement). No direct impacts on bird populations, including those associated with the Tamar Estuaries Complex SPA and Ramsar site, St Johns Lake SSSI and Lynher Estuary SSSI are anticipated, assuming that SDP activities take place within the nuclear licensed site. There could be the potential for indirect adverse impacts if a significant pollution incident occurred that adversely impacted upon the SPA and SSSI habitat. Devonport dockyard is downstream of the Lynher Estuary SSSI and so the potential for SDP activities to impact on the SSSI habitat is considered unlikely unless a significant pollution incident occurred and pollutants were carried upstream by the tide. <u>Rosyth Dockyard</u> The Firth of Forth SPA (complex of estuarine and coastal habitats), Ramsar site and SSSI is

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				located approx. 0.3km to the west of Rosyth dockyard at its closest point. The SPA and Ramsar site is primarily designated for its wintering populations of red-throated diver, slavonian grebe, golden plover and bar-tailed godwit and post-breeding population of sandwich tern. The SSSI is designated for its geology and ecology (bird and beetle populations). St Margaret's Marsh SSSI is also located approx. 0.5km to the south-east, which supports an extensive area of coastal reedbed and saltmarsh. It is noted that the Firth of Forth SPA is both upstream and downstream of the Rosyth dockyard, and the estuary is tidal. St Margaret's Marsh is located downstream of the dockyard. The major factor affecting the Forth of Firth SPA is coastal industrial development, although this is regulated. Localised tipping and commercial bait digging are also issues. Surveys carried out to inform the development of land to the east of Rosyth dockyard recorded over 50 species of bird in the area of Rosyth dockyard. The surveys identified 28 breeding bird species and 12 wintering bird species of conservation interest, although all were widespread species in the UK and none were recorded in significant numbers. Herring gull and redshank were recorded in the intertidal zone south of the dockyard, although only as one or two birds. Surveys carried out for the Forth Replacement Crossing documented few coastal birds near the Port of Rosyth, whereas more species and higher numbers were recorded in sectors east of the North Queensferry Railway Pier, including mudflats at Inverkeithling, as well as land over 1.5km west of the Port of Rosyth.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-	0/-	-	The Firth of Forth supports a diverse fish community, including resident, marine migrant, nursery-using and overwintering species, as well as those undertaking diadromous migrations (between freshwater and salt water). It acts as a migration route for river lamprey, sea lamprey, salmon and sea trout between coastal waters and their spawning areas. In addition, the smelt, an estuarine species of conservation concern, lives in the Firth of Forth. Other fish, such as flounder, move the estuary to feed, and it provides important nurseries for North Sea fish including herring, sand eel, sprat, cod, whiting, saithe, dab and plaice. It is understood from evidence collated for the Firth of Forth Replacement Crossing that both common and grey seals frequent the Firth of Forth throughout the year. JNCC maps show that harbour porpoise is present in or near the Firth of Forth most of the year and present in small groups (1-10 animals recorded per hour) in the Inner Firth of Forth during the months of March and August. Common and grey seal and harbour porpoise are not features of the SAC but Bottlenoise dolphin, minke whale and white-beaked dolphin also regularly visit the Firth of Forth, but are not frequent visitors west of the Forth Road Bridge. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any physical displacement of marine habitat or species (e.g. sandbanks). There is the potential for SDP activities at Rosyth dockyard to impact on the marine environment and ecosystems, including habitats associated with the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI. The potential for adverse effects is considered to be minor as SDP activities would primarily be undertaken in facilities on the dockyard, with the exception of RPV removal, which would take place in the DBV adjacent to the basin; and adoption of pollution prevention techniques would mitigate any risk. However, there could be the potential for significant adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water). As the dockyard basins connect to the estuary there is the potential for fish to access the basins. Depending on their presence within the basins, there could be the potential for submarine docking operations (flooding and subsequent dewatering of the dock) to have minor effects on fish populations (e.g. disturbance and displacement). No direct impacts on bird populations, including those associated with the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI, are anticipated, assuming that SDP activities take place within the nuclear licensed site which is considered unlikely to support

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				these bird populations. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 5D could therefore potentially have a greater impact on biodiversity as the range of construction activities would be greater, although no significant impacts on biodiversity from construction are anticipated. There is a greater potential for SDP activities at Devonport dockyard to impact on designated nature conservation sites, protected species and the structure and function of ecosystems. This is due to the proximity of the Plymouth Sound & Estuaries SAC adjacent to the dockyard, which comprises a number of Annex I marine habitats and Annex II species sensitive to waterside activities, port development and pollution.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-	0/-	-	Although SDP activities at Rosyth dockyard could also potentially impact on designated sites, taking account of the location, nature and sensitivity of the habitats, the potential for adverse impacts is considered to be greater at Devonport dockyard. In the case of Option 5D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 5R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts on the marine environment associated with submarine transportation could therefore be greater for Option 5R, although no significant impacts on biodiversity from submarine transportation are anticipated. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Taking into account distance only, there is a greater potential for transport of LLW from Devonport dockyard to have a greater impact on biodiversity associated with the transport of waste when compared to Rosyth dockyard, although no significant impacts on biodiversity from the transport of waste are anticipated. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation/size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, as submarine dismantling activities would be undertaken on two different sites (initial dismantling of the RPV taking place at one dockyard, and full segregation of the RPV and interim storage taking place at the other dockyard), this combination option could result in a greater number of transport movements compared to Options 5D and 5R. Option 5B could therefore have a greater potential for impacts on biodiversity associated with transport when compared to Options 5D and 5R. Depending on submarine transportation methods, there could be a requirement for dredging in the case of Option 5B if heavy lift operations are required at Devonport dockyard although as submarines are likely to be towed to Devonport dockyard for dismantling, dredging is unliklely to be required. Nonetheless, the overall scale of potential effect could be less than that of Option 5D, as SDP activities would take place at both dockyards and therefore the timescale of any disturbance would be less.

Options 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems.	-/?	-/0 /?	-/?	**Potential Effects** The Devonport and Rosyth dockyards are well established dockyards, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. No direct loss of protected or notable habitats as a result of initial dismantling and segregation/size reduction activities at the dockyards is therefore anticipated. Similarly, no effects on public access to areas of wildlife interest are anticipated as a result of SDP activities at the Devonport and Rosyth dockyards, as the dockyards are not accessible to the public and do not contain any areas of wildlife interest. There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. It is expected that submarines will be wet towed into the dockyard. Submarine transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility may indirectly impact on the marine environment and fisheries (e.g. disturbance of habitats and species or pollution from accidental spillage). Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on biodiversity, although the likelihood of such an event occurring is exceptionally small. There is the potential for the transport of submarines to and from the Devonport and Rosyth dockyards and the ship recycling facility to spread invasive species (flora and fauna) between waters. The likelihood of such an effect would depend on the presence of invasive species, which cannot be determined at this stage. Notwithstanding this, the probability of any such effect occurring is considered to be exceptionally low. There is the potential for SDP activities within the Devonport and Rosyth dockyards (initial dismantling & segregation/size reduction of the RPV) to impact on the marine environment and ecosystem. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of significant effects on biodiversity during normal operations. However, there is the potential for impacts, e.g. accidental release of pollutants during construction such as silty run-off or spilled fuel and oils; and accidental release of pollutants and radioactive material during RPV removal and segregation, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV. At both Devonport and Rosyth, there is the potential for indirect impacts on marine habitats and species, including internationally and nationally designated sites (*refer to impacts specific to the Devonport and Rosyth dockyards*). In the case of this option, following full dismantling of the RPV and packaging of the wastes the LLW would be transported off the dismantling site for disposal in the LLWR as appropriate, and the PW (ILW) would be transported off the dismantling site to a remote site for interim storage. It is unknown whether an existing storage facility would be available for use, or whether a new facility would need to be constructed. Depending on the biodiversity value of the remote site and its surrounds, construction of interim storage (if required) could have an impact on habitats, species and ecosystems, e.g. direct habitat loss or fragmentation due to development, disturbance and changes in character due to alterations in drainage patterns and deposition of pollutants.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/0 /?	-/?	Depending on the site location there could be the potential for impacts on statutory and non-statutory designated sites and other protected and notable habitats and species. There could also be the potential for interim storage to affect public access to areas of wildlife interest, depending on the nature of the remote site and any access restrictions. At this stage a site has not been identified and subsequently the effect of interim storage on biodiversity is uncertain. No impacts on biodiversity are anticipated as a result of interim storage activities, as the storage of the PW is assumed to be a relatively passive activity with the PW remaining in-situ. Although depending on the biodiversity value of the remote site and surrounds there could be the potential for impacts in the unlikely event of a container breach that resulted in a significant pollution incident. There could be the potential for transport movements associated with SDP activities, e.g. vehicle movements to and from the dismantling site and remote site such as staff, plant equipment and deliveries, and general wastes; transport of LLW off the dismantling site to the LLWR for disposal; transport of the PW from the dismantling site to the remote site; and transport of the PW off the remote site to the GDF via road and/or rail to impact on biodiversity, including noise and vibration disturbance from vehicle movements, the deposition of pollutants from vehicle exhausts, and accidental spill risk (e.g. fuel and oils). However, no significant impacts are anticipated taking account of estimated transport movements, and that the potential for an accident or incident to occur is considered to be low. Modifications to existing facilities and the construction of new facilities at the Devonport and Rosyth dockyards and the remote site as required may indirectly impact on biodiversity through the supply chain. This could be through sourcing mineral, aggregates or timber resources from locations adjacent to important habitats or species. However, it is assumed that such activities will be permitted so such effects (if any) will be considered acceptable. As it is unknown at this stage where materials would be sourced, the potential for impacts cannot be determined at this stage. Design specifications for the dismantling and segregation/size reduction facilities are not available at this stage, although for the purposes of the assessment it is assumed that dismantling and segregation/size reduction facilities would not differ greatly between the options. For all of the options it is assumed that interim storage areas would need to be constructed, with storage of PW expected to require 1,005m^2. Taking account of interim storage requirements, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option. However, in the case of the PW option as it involves full early dismantling of the RPV and segregating the ILW and LLW prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on biodiversity from SDP activities as levels of activity and disturbance would be greater. Notwithstanding this, construction would take place on two different sites, reducing any impacts on biodiversity from SDP activities as the scale of activity undertaken at the respective sites would be less. Although in the case of all of the technical options, as BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on biodiversity. The PW option is considered to carry a very small risk (but slightly higher than either RC or RPV options) of unplanned release of radioactive material associated with dismantling, as the RPV would be removed from the RC and would be fully dismantled ‘immediately’. The in-situ decay of short lived isotopes will not have occurred to the same extent as for the RC or RPV options and in consequence, this option involves management of material with higher levels of activity. Neverthless, the risk of unplanned radiological exposure is considered to be low because of the statutory safety requirements that are in place. There is considered to be less potential for the release of non-radiological pollutants to the environment during initial dismantling (RPV removal) when compared to the RC option as the RC would to some extent act as a shield during RPV removal and and the submarine hull would largely remain intact.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/0 /?	-/?	Devonport Dockyard The Plymouth Sound & Estuaries SAC is directly adjacent to Devonport dockyard. Its primary reasons for designation are the sandbank, estuary, inlet & bay, reef and Atlantic salt meadow habitats, some of which support extremely rich marine flora and fauna. Annex II species associated with the SAC include sea lamprey, river lamprey, Allis shad and twaite shad (all of which spawn in freshwater and are found in coastal waters, estuaries and rivers), along with dolphin, porpoise, otter and grey seal. The Tamar Estuaries Complex SPA and Ramsar site and St Johns Lake SSSI is also located approx. 1.4km south-west of the dockyard. The SPA is primarily designated for its breeding populations of avocet and little egret. The SSSI is designated for its wintering wildfowl and wader populations and saltmarsh flora. In addition, Lynher Estuary SSSI is located approx. 2.7km west of the dockyard; designated for its extensive saltmarsh, which together with the adjacent mudflats provide important feeding and roosting grounds for large populations of wintering wildfowl and waders. Key issues for the Plymouth Sound & Estuaries SAC and the Tamar Estuaries Complex SPA and Ramsar site include increased pressure for moorings and associated facilities, port development, and oil pollution. The Tamar estuaries are sea trout and salmon rivers, with the fish passing through the estuary for the spring and autumn runs to the upriver spawning sites. These are largely between May to June and September to October, but fish are dependant on the river flows and will congregate in the estuary until the river conditions are suitable. Sea trout smolts come down through the estuary in April and May. Allis Shad migrate up the estuary to spawning grounds between March and June. It is understood that fish migrations do dictate the timings of certain activities in the estuary. Seabass are understood to be present in the estuary all year round, with the seabass nursery areas upstream of the dockyard in the saltmarsh/mudflat areas of the Lynher Estuary and elsewhere. There are fishes, particularly grey mullet, in the dockyard's basins but with the exception of the tidal 4 basin fish have limited opportunity to move to and from the estuary. Development along the estuary has restricted the available areas in the locality of the dockyard for bird populations, with only the mudflats off Torpoint and Wilcove supporting reasonable numbers of birds. Among these are godwits, particularly Black-tailed Godwit which is a relatively scarce species on the estuary. High tide roosts on pontoons and other structures attract birds from other parts of the estuary such as cormorant, oystercatcher, dunlin and turnstone in particular. Wadng birds frequent the mudflat on Weston Mill Creek to the north of the dockyard, where a small amount of saltmarsh vegetation is found. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/0 /?	-/?	Previous studies have determined that PAHs, principally from urban run-off, combustion and dockyard activities, are major contaminants in the lower part of the Tamar estuary. It is reported that dredged sediment from the estuary is toxic to mussels, and if highly resistant species such as mussels are being harmed by PAHs, then other animals in the ecosystem could also be adversely affected. There is evidence of a decline in animal health which may be related to increased mobilisation of PAH contaminated sediment by dredging, although there is insufficient data available to draw firm conclusions. There is also the potential for SDP activities at Devonport dockyard to indirectly impact on the marine environment and ecosystems, including the designated nature conservation sites (Plymouth Sound & Estuaries SAC and St Johns Lake SSSI). The potential for adverse effects is considered to be minor as the adoption of pollution prevention techniques would mitigate any risk. However, there could be the potential for significant adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water). As the dockyard basins connect to the estuary there is the potential for fish to access the basins, including several Annex II fish species (sea lamprey, river lamprey, allis shad and

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				twaite shad) associated with the Plymouth Sound & Estuaries SAC. Depending on their presence within the basins, there could be the potential for submarine docking operations (flooding and subsequent dewatering of the dock) to have very minor effects on fish populations (e.g. disturbance and displacement). No direct impacts on bird populations, including those associated with the Tamar Estuaries Complex SPA and Ramsar site, St Johns Lake SSSI and Lynher Estuary SSSI are anticipated, assuming that SDP activities take place within the nuclear licensed siteThere could be the potential for indirect adverse impacts if a significant pollution incident occurred that adversely impacted upon the SPA and SSSI habitat. Devonport dockyard is downstream of the Lynher Estuary SSSI and if required heavy lift operations would take place downstream of the dockyard, so the potential for SDP activities to impact on the SSSI habitat is considered unlikely unless a significant pollution incident occurred and pollutants were carried upstream by the tide. Rosyth Dockyard The Firth of Forth SPA (complex of estuarine and coastal habitats), Ramsar site and SSSI is located approx. 0.3km to the west of Rosyth dockyard at its closest point. The SPA and Ramsar site is primarily designated for its wintering populations of red-throated diver, slavonian grebe, golden plover and bar-tailed godwit and post-breeding population of sandwich tern. The SSSI is designated for its geology and ecology (bird and beetle populations).
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/0 /?	-/?	St Margaret's Marsh SSSI is also located approx. 0.5km to the south-east, which supports an extensive area of coastal reedbed and saltmarsh. It is noted that the Firth of Forth SPA is both upstream and downstream of the Rosyth dockyard, and the estuary is tidal. St Margaret's Marsh is located downstream of the dockyard. The major factor affecting the Forth of Firth SPA is coastal industrial development, although this is regulated. Localised tipping and commercial bait digging are also issues. Surveys carried out to inform the development of land to the east of Rosyth dockyard recorded over 50 species of bird in the area of Rosyth dockyard. The surveys identified 28 breeding bird species and 12 wintering bird species of conservation interest, although all were widespread species in the UK and none were recorded in significant numbers. Herring gull and redshank were recorded in the intertidal zone south of the dockyard, although only as one or two birds. Surveys carried out for the Forth Replacement Crossing documented few coastal birds near the Port of Rosyth, whereas more species and higher numbers were recorded in sectors east of the North Queensferry Railway Pier, including mudflats at Inverkeithling, as well as land over 1.5km west of the Port of Rosyth. The Firth of Forth supports a diverse fish community, including resident, marine migrant, nursery-using and overwintering species, as well as those undertaking diadromous migrations (between freshwater and salt water). It acts as a migration route for river lamprey, sea lamprey, salmon and sea trout between coastal waters and their spawning areas. In addition, the smelt, an estuarine species of conservation concern, lives in the Firth of Forth. Other fish, such as flounder, move the estuary to feed, and it provides important nurseries for North Sea fish including herring, sand eel, sprat, cod, whiting, saithe, dab and plaice. It is understood from evidence collated for the Firth of Forth Replacement Crossing that both common and grey seals frequent the Firth of Forth throughout the year. JNCC maps show that harbour porpoise is present in or near the Firth of Forth most of the year and present in small groups (1-10 animals recorded per hour) in the Inner Firth of Forth during the months of March and August. Common and grey seal and harbour porpoise are not features of the SAC but Bottlenoise dolphin, minke whale and white-beaked dolphin also regularly visit the Firth of Forth, but are not frequent visitors west of the Forth Road Bridge. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				transportation to and from Rosyth dockyard is therefore not anticipated to result in any physical displacement of marine habitat or species (e.g. sandbanks). There is the potential for SDP activities at Rosyth dockyard to impact on the marine environment and ecosystems, including habitats associated with the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI. The potential for adverse effects is considered to be minor as the adoption of pollution prevention techniques would mitigate any risk. However, there could be the potential for significant adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water). No direct impacts on bird populations, including those associated with the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI, are anticipated, assuming that SDP activities take place within the nuclear licensed site which is considered unlikely to support these bird populations. As the dockyard basins connect to the estuary there is the potential for fish to access the basins. Depending on their presence within the basins, there could be the potential for submarine docking operations (flooding and subsequent dewatering of the dock) to have minor effects on fish populations (e.g. disturbance and displacement).
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/0 /?	-/?	**<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 6/8D could therefore potentially have a greater impact on biodiversity associated with construction activities within the dockyards, although no significant impacts on biodiversity from construction are anticipated. There is a greater potential for SDP activities at Devonport dockyard to impact on designated nature conservation sites, protected species and the structure and function of ecosystems. This is due to the proximity of the Plymouth Sound & Estuaries SAC adjacent to the dockyard, which comprises a number of Annex I marine habitats and Annex II species sensitive to waterside activities, port development and pollution. Although SDP activities at Rosyth dockyard could also potentially impact on designated sites, the Firth of Forth SPA and Ramsar site and St Margaret's Marsh SSSI, taking account of the location, nature and sensitivity of the habitats, the potential for adverse impacts is considered to be greater at Devonport dockyard. In the case of Option 6/8D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 6/8R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts on the marine environment associated with submarine transportation could therefore be greater for Option 6/8R, although no significant impacts on biodiversity from submarine transportation are anticipated. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Taking into account distance only, there is a greater potential for transport of LLW from Devonport dockyard to have a greater impact on biodiversity associated with the transport of waste when compared to Rosyth dockyard, although no significant impacts on biodiversity from the transport of waste are anticipated. At this stage a remote site for interim storage and segregation/size reduction has not been identified and subsequently the potential effect of these activities on biodiversity is uncertain. The potential for effects would depend on the location of the remote site, the biodiversity value of the site and its surrounds, the sensitivity of habitats/species present, and the level of habitat disturbance or loss.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				Combination Option If both the Devonport and Rosyth dockyards are utilised for SDP activities, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. At this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined. However, as submarine dismantling activities would be undertaken on three different sites (initial dismantling of the RPV taking place at one dockyard, and full segregation/size reduction of the RPV taking place at the other dockyard and interim storage of the PW at a remote site), this combination option could result in a greater number of transport movements compared to Options 6/8D and 6/8R. Option 6/8B could therefore have a greater potential for impacts on biodiversity associated with transport. Notwithstanding this, undertaking SDP activities on three different sites may help to reduce disturbance levels.
A. Biodiversity and Nature Conservation Protect and enhance habitats, species and ecosystems. *(continued)*	-/?	-/0 /?	-/?	Nonetheless, the overall scale of potential effect could be less for 6/8B than that of Option 6/8D, as dismantling activities would take place at both dockyards and therefore the timescale of any disturbance would be less.

A2. Population

2.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

In the absence of detailed SEA guidance on the content of the population topic, 'population' includes information on demographics and generic socio-economic issues. The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on population and socio-economics. Information is presented for both national and sub-regional levels.

There are links between the population topic and a number of other SEA topics, in particular the effects of population on human health, waste, transport, air quality and climate change.

2.2 Summary of Plans and Programmes

2.2.1 International

The United Nation's ***Aarhus Convention (2001)*** grants the public rights and imposes on Parties and public authority's obligations regarding access to information, public participation and access to justice. It contains three broad themes or 'pillars':

- access to information;
- public participation; and
- access to justice.

The ***SEA Directive*** creates the following requirements for public consultation;

- Authorities which, because of their environmental responsibilities, are likely to be concerned by the effects of implementing the plan or programme, must be consulted on the scope and level of detail of the information to be included in the Environmental Report. These authorities are designated in the SEA Regulations as the Consultation Bodies (Consultation Authorities in Scotland).

- The public and the Consultation Bodies must be consulted on the draft plan or programme and the Environmental Report, and must be given an early and effective opportunity within appropriate time frames to express their opinions.

- Other EU Member States must be consulted if the plan or programme is likely to have significant effects on the environment in their territories.

- The Consultation Bodies must also be consulted on screening determinations on whether SEA is needed for plans or programmes under Article 3(5), i.e. those which may be excluded if they are not likely to have significant environmental effects.

The ***European Employment Strategy*** seeks to engender full employment, quality of work and increased productivity as well as the promotion of inclusion by addressing disparities in access to labour markets. These overarching aims are further espoused in the ***Integrated Guideline for Growth and Jobs 2008-11*** and later documents relating policy objectives into broad actions for the member states (***A Shared Commitment for Employment***, 2009; and, ***Implementation of the Lisbon Strategy Structural Reforms in the context of the European Economic Recovery Plan***, 2009).

2.2.2 National

UK

The primary aim of the ***PSA Delivery Agreement 1: Raise the Productivity of the UK Economy (2007)*** is to demonstrate further progress on its long-term objectives to:

- raise the rate of the UK's productivity growth over the economic cycle; and

- narrow the productivity gap with our major industrial competitors.

The White Paper entitled ***Strong and prosperous communities (2006)*** aims to give local people and communities more influence and power to improve their lives.

Key documents on economy include ***Planning a Sustainable Future (2007), UK Economy: Addressing the Long Term Challenges (2008)*** and the ***New Opportunities White Paper: Fair Chances for the Future (2009)***. These documents generally present economic goals or objectives related to the economy within the context of climate change and the need to meet the challenges posed thereby.

Within ***MOD Sustainable Development Strategy (2008)*** and ***MOD Sustainable Development Report and Action Plan (2008)*** are objectives especially relevant to socio-economics, including to;

- help build the skills of young people;
- create a workforce that is drawn from the breadth of society and ensure that the unique contribution of every individual in that workplace is respected and valued;
- provide a safe and healthy workplace; and
- manage the social impacts of Defence activities on UK communities (civilian and Armed Forces).

England

Planning Policy Statement 4 (PPS4) (2009) sets out planning policies for economic development which is taken to include developments which;

- provides employment opportunities;
- generates wealth; or
- produces or generates an economic output or product.

Scotland

Scottish Planning Policy (SPP) (2010) sets out the Scottish Government's policy on land use planning. With regard to economic development, SPP sets out the following five areas where planning can support growth:

- taking account of the economic benefits of proposed development in development plans and development management decisions;
- promoting development in sustainable locations, particularly in terms of accessibility;
- promoting regeneration and the full and appropriate use of land, buildings and infrastructure;
- supporting development which will provide new employment opportunities and enhance local competitiveness; and
- promoting the integration of employment generation opportunities with supporting infrastructure and housing development.

The four key outcomes of Scottish Executive's ***Framework for Economic Development in Scotland (2004)*** which are fundamental to their economic policy are;

- economic growth;
- regional development;
- closing the opportunity gap; and
- sustainable development.

The ***Scottish Sustainable Communities Initiative (SSCI) (2008)*** encourages settlements which provide high quality, affordable homes for all sectors of the community, which may include opportunities for the creation of jobs, provision of education and other services necessary to enable high standards of living, cultural identity and create an environment which encourages healthy and active living.

Wales

With respect to economic development, ***Planning Policy Wales (2010)*** sets out that the Welsh Assembly Government's objectives are to:

- enhance the economic success of both urban areas and the countryside;
- support initiative and avoid placing unnecessary burdens on enterprise;
- respect and encourage diversity in the local economy; and
- promote the exploitation of new technologies which can provide new opportunities.

The ***Wales Spatial Plan (2008)*** contains the following key themes which relate to population;

- building sustainable communities;
- promoting a sustainable economy; and
- respecting distinctiveness.

Technical Advice Note 12 (TAN12) sets out the Assembly Government's policies and objectives in respect of the design of new development, including; ensuring attractive, safe public spaces and ensuring ease of access for all.

The ***Green Jobs Strategy for Wales (2009)*** sets out how businesses and other organisations could be helped to adapt and capitalise on the opportunities presented by the drive towards a local carbon, resource efficient and sustainable products and processes.

Northern Ireland

Ireland's ***National Development Plan (2007)*** is a €184 billion plan which represents a major milestone in building a prosperous Ireland for all people, characterised by sustainable economic growth, greater social inclusion and balanced regional development. The ***National Spatial Strategy for Ireland (NSS) (2002-2020)*** is a twenty year planning framework deigned to achieve a better balance of social, economic, physical development and population growth between regions.

Growing the economy is a top priority for the ***Programme for Government (2008-2011)*** and the ***2015 Economic Vision for the Northern Ireland Economy (2005).*** Targets regarding inequalities, deprivation and poverty are included in the Government's ***Lifetime Opportunities: Anti-poverty and Social Inclusion Strategy (2006).***

2.2.3 Sub-regional locations

Plymouth

The Way Ahead Delivering Sustainable Communities in the South West (2004) aims to support existing strategies to bring about acceleration in the provision of housing, improved regional productivity, and to harness the benefits of this growth to address regional inequalities and economic under-performance. Within this strategy Plymouth, as well as Bristol, Swindon and Exeter, are targeted as key Cornish towns. ***Devon's Sustainable Community Strategy (2008)*** aims to improve aspects of the quality of life regarding a growing economy.

The South West's Integrated Regional Strategy 2004-2026 (2004) aims to harness the benefits of population growth to improve economic and employment opportunities, reduce deprivation and ensure full community participation.

Strategies on the economy in the South West include; ***Regional Economic Strategy for the South West of England 2006 -2015 (2006),*** and ***South West Framework for Employment and Skills Action (2004).*** Plymouth's ***Local Economic Strategy 2006-2021 (2006)*** aims to focus on the key sectors of which Plymouth has competitive advantage, increase entrepreneurship, enhance tourism and achieve unconstrained participation in the labour market, among other things.

Fife

Fife's Economic Strategy 2009-2020 (2009) contains the following 6 strategic objectives:

- Increase the number of employees in medium and large enterprises by 10% (6,000 jobs);
- 80% of the working age population in employment;

- Attract private sector investment through Invest in Fife;
- Double the amount of business expenditure in research and development to £36m;
- Grow Fife's tourism sector revenue by 20% (£51m);
- Increase the number of people employed in green jobs.

Fife's Community Plan 'A Stronger Future for Fife' (2004) contains a plan to deliver the vision for Fife and includes the aim to build a stronger, more flexible and diverse economy.

2.3 Overview of the Baseline

2.3.1 National

UK

National Demographics

In mid 2008 the resident population of the UK was 61,383,200 in mid-2008.[51] and 62% of the population was working age (aged 15 to 64) (66.1% males and 58.1% females). [51] The working age population in 2009 was broken down as follows: [52]

- 76.5% economically active;
- 70% in employment;
- 7.8% unemployed.

The breakdown of qualifications of the working age population in 2009 was as follows;

- 29.8% had NVQ4 and above;
- 15.4% had NVQ3 and above;
- 16% had NVQ2 and above;
- 13.4% had NVQ1 and above;

[51] Office for National Statistics 2008 mid-year population estimates
[52] NOMIS, Official Labour Market Statistics, Annual Population Survey, 2010, https://www.nomisweb.co.uk

- 8.7% had other qualifications; and
- 12.6% have no qualifications.

In England and Wales, between 2008/09 and 2009/10 estimates from the British Crime Survey (BCS) indicate vehicle-related thefts fell by 17 per cent, burglary fell by 9% and violent crime fell by one per cent. All BCS crime fell by 9%.

Table 2.1 Number of crimes recorded by the police in England and Wales:[53]

	2008/09	2009/10	Change
	Number of offences (thousands)		%
Vandalism	2,700	2,408	-11
Burglary	725	659	-9
Vehicle-related theft	1,476	1,229	-17
Bicycle theft	527	480	-9
Other household theft	1,155	1,163	1
Household acquisitive crime	3,883	3,531	-9
All household crime	6,583	5,939	-10
Theft from the person	725	525	-28
Other theft of personal property	1,096	1,036	-5
All violence	2,114	2,087	-1
Personal acquisitive crime	2,094	1,895	-9
All personal crime	3,936	3,648	-7
All BCS Crime	10,518	9,587	-9

[53] Home Office, British Crime Survey in England and Wales 2009/10, http://rds.homeoffice.gov.uk/rds/pdfs10/hosb1210.pdf

In 2008/09, the UK had a total of 33,396 schools which were broken down as follows:

- 3,209 nursery (150,300 students);
- 21,568 primary (4,868,800 students);
- 4,183 secondary (3,928,500 students);
- 1,378 special (100,900 students); and
- 511 pupil referral units (15,700 students).[54]

Total of 9,064,200 pupils at maintained schools and a further 627,100 at non-maintained schools). [54]

MOD employs some 281,000 military and civilian personnel. [55]

National Socio-Economic:

In 2008 UK per capita Gross Value Added (GVA) was £20,520.[56]

In 2009 the median full-time gross hourly pay in UK was £12.43 (males' median being £13.09 and the female median being £11.42). This compares to £11.98 in 2008.[57] In the three months to July 2010 pay growth (including bonuses) rose by 1.2% in the private sector over the previous year compared with 2.7% for the public sector. Excluding bonus payments, growth in the private sector over the year was 1.3% compared with 2.8% for the public sector.[58]

In the period May - July 2010 the UK had a total of 29,158,000[59] jobs.

In Jan 2009 - Dec 2009, the UK had an unemployment rate of 7.8% (all people of working age). This compares to the previous year when the UK had an unemployment rate of 5%.[60]

The recent UK recession has caused a downturn in many sectors and markets of the UK economy, however in the second quarter of 2010 the UK Economy grew by 1.7% compared to the second quarter of 2009. Changes between quarters have also been positive (UK GDP rose by 1.2% between the first

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[54] DCSF, Education and Training Statistics for the United Kingdom: 2009, http://www.dcsf.gov.uk/rsgateway/DB/VOL/v000891/Chapter1.xls
[55] MOD, Sustainable Development Report and Action Plan, 2009, http://www.mod.uk/NR/rdonlyres/F9E34976-9E39-4E0D-BADA-157975DF2118/0/stewardshiprpt200809v7.pdf
[56] Regional, sub-regional and local gross value added 2009, http://www.statistics.gov.uk/pdfdir/gva1209.pdf
[57] NOMIS, Official Labour Market Statistics, Annual survey of hours and earnings - resident analysis https://www.nomisweb.co.uk/output/dn87000/{AFB7B1A5-142C-4D4F-BDE2-467C1389CB90}/nomis_2009_08_20_160703.xls
[58] ONS Labour Market Statistics, May 2010, http://www.statistics.gov.uk/pdfdir/lmsuk0510.pdf
[59] Nomis, Labour Force Survey, May - July 2010, https://www.nomisweb.co.uk
[60] NOMIS, Official Labour Market Statistics, National Indicators, June-August 2009, https://www.nomisweb.co.uk/articles/news/files/LFS%20headline%20indicators.xls

and second quarter. [61] Output of the production industries rose by 2% between the second quarter of 2009 and the second quarter of 2010; output in the service industries rose 1.5%. Manufacturing output grew by 4.3% [61]

The MOD is a major source of employment. Some 281,000[62] sailors, soldiers, airmen and civilians are directly employed in Defence, and many more are sustained indirectly in the Defence industry through the £38.6Bn the Department spent in 2008/09 to support and equip the Armed Forces.[63]

Defence and Aerospace is the United Kingdom's second largest industry sector. The Typhoon programme alone sustains an estimated 100,000 UK jobs, many highly skilled and paid, and has produced a number of technology spin-offs. [64]

England

National Demographic

In mid-2008 England had a resident population of 51,464,600 and 66.3% of the population is of working age (aged 15 to 64) split by gender, 49.2% males and 50.8% females.

In 2009 the working age population breakdown was as follows:

- 77.1% were economically active;
- 71.1% of working age population were in employment.
- 7.8% of working age population were unemployed. [65]

The working age population in 2009 had the following qualification breakdown:

- 29.6% have NVQ4 and above;
- 48.9% have NVQ3 and above;
- 65.0% have NVQ2 and above;
- 78.9% have NVQ1 and above;

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[61] ONS, UK Snapshot, http://www.statistics.gov.uk/instantfigures.asp
[62] MOD, Sustainable Development Report and Action Plan, 2009, http://www.mod.uk/NR/rdonlyres/F9E34976-9E39-4E0D-BADA-157975DF2118/0/stewardshiprpt200809v7.pdf
[63] NOMIS, Official Labour Market Statistics, National Indicators, June-August 2009, https://www.nomisweb.co.uk/articles/news/files/LFS%20headline%20indicators.xls
[64] MOD, Stewardship Report on the Defence Estates, 2007-08, http://www.defence-estates.mod.uk/estate/estatestrategy.php
[65] ONS Economic activity time series https://www.nomisweb.co.uk/reports/lmp/gor/2092957699/subreports/nrhi_time_series/report.aspx?

- 13.3% have other qualifications; and
- 9.1% have no qualifications.[66]

In 2008/09, England had 24,737 schools:

- 438 nursery (37,200 students);
- 17,064 primary (4,074,900 students);
- 3,361 secondary (3,271,100 students);
- 1,058 special (85,500 students); and
- 458 pupil referral units (15,200 students).[67]

National Socio-Economic

In 2008 England's per capita Gross Value Added (GVA) was 21,020.[68]

In 2009 the median full-time gross hourly pay in England was £12.56 (males' median being £13.28 and the female median being £11.50). This compares to £12.13 in 2008 and represents growth of 3.5% in nominal hourly total full time pay over the previous year. [69]

In 2009, England had a total of 26,246,000 jobs.[70]

In Feb 2008 - Jan 2010, England had an unemployment rate of 7.8% (all people of working age). This compares to the previous year when it had an unemployment rate of 6%.[71]

Output of the English economy rose by 3.5% between 2007 and 2008.[72]

Scotland

National Demographic

In mid-2008 Scotland had a resident population of 5,168,500 and 67% of the population is of working

[66] ONS https://www.nomisweb.co.uk/reports/lmp/gor/2013265930/report.aspx
[67] DCSF, Education and Training Statistics for the United Kingdom: 2009, http://www.dcsf.gov.uk/rsgateway/DB/VOL/v000891/Chapter1.xls
[68] Regional, sub-regional and local gross value added 2009, http://www.statistics.gov.uk/pdfdir/gva1209.pdf
[69] ONS: Earning by workplace https://www.nomisweb.co.uk/reports/lmp/gor/2092957699/subreports/gor_ashew_time_series/report.aspx
[70] ONS https://www.nomisweb.co.uk/reports/lmp/gor/2013265930/report.aspx
[71] ONS https://www.nomisweb.co.uk/reports/lmp/gor/2092957699/subreports/nrhi_time_series/report.aspx
[72] Regional, sub-regional and local gross value added 2009, http://www.statistics.gov.uk/pdfdir/gva1209.pdf

age (aged 15 to 64) split by gender, 49% males and 51% females. [73]

In 2009 the working age population breakdown was as follows:

- 77% were economically active;
- 71.2% of working age population were in employment.
- 7.4% of working age population were unemployed. [74]

The working age population in 2009 had the following qualification breakdown:

- 33.9% have NVQ4 and above;
- 49.3% have NVQ3 and above;
- 63.8% have NVQ2 and above;
- 73.6% have NVQ1 and above;
- 7.6% have other qualifications; and
- 13.3% have no qualifications.[74]

Differences in legal systems and police recording mean that the recorded crime figures for Scotland are not directly comparable with recorded crime figures for England and Wales. In Scotland, recorded vehicle theft and robbery decreased by 19 per cent and 16 per cent respectively between 2008/09 and 2009/10. Overall crime fell by 10%.

In 2008/09, Scotland had 5,521 schools:

- 7.6% have other qualifications; and
- 2,645 nursery (105,400 students);
- 2,153 primary (370,800 students);
- 376 secondary (304,000 students);

[73] Office for National Statistics 2008 mid-year population estimates
[74] NOMIS, Official Labour Market Statistics, Annual Population Survey, 2010, https://www.nomisweb.co.uk

- 234 special (7,700 students); and
- no pupil referral units.[75]

National Socio-Economic

In 2008 Scotland's per capita Gross Value Added (GVA) was 20,086.[76]

In 2009 the median full-time gross hourly pay in Scotland was £12.04 (males' median being £12.56 and the female median being £11.31). This compares to £11.60 in 2008 and represents growth of 3.8% in nominal hourly total full time pay over the previous year. [77]

In 2009 Scotland had a total of 2,455,000 jobs. [78]

In Jan 2009 - Dec 2009, Scotland had an unemployment rate of 7.1% (all people of working age). This compares to the previous year when it had an unemployment rate of 5%.[79]

Output of the Scottish economy rose by 4.7% between 2007 and 2008[80]

Wales

National Demographic

In mid-2008 the resident population of Wales was 2,993,400 and 64.8% of the population were of working age (49.5% males and 50.5% females). [81]

In 2009, the working age population was broken down as follows:

- 72.7% economically active;
- 66.6% in employment; and
- 8.4% unemployed. [82]

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[75] DCSF, Education and Training Statistics for the United Kingdom: 2009, http://www.dcsf.gov.uk/rsgateway/DB/VOL/v000891/Chapter1.xls
[76] Regional, sub-regional and local gross value added 2009, http://www.statistics.gov.uk/pdfdir/gva1209.pdf
[77] NOMIS, Official Labour Market Statistics, Annual survey of hours and earnings - resident analysis https://www.nomisweb.co.uk/output/dn87000/{AFB7B1A5-142C-4D4F-BDE2-467C1389CB90}/nomis_2009_08_20_160703.xls
[78] ONS https://www.nomisweb.co.uk/reports/lmp/gor/2013265930/report.aspx
[79] NOMIS, Official Labour Market Statistics, National Indicators, June-August 2009, https://www.nomisweb.co.uk/articles/news/files/LFS%20headline%20indicators.xls
[80] Regional, sub-regional and local gross value added 2009, http://www.statistics.gov.uk/pdfdir/gva1209.pdf
[81] Office for National Statistics 2008 mid-year population estimates
[82] NOMIS, Official Labour Market Statistics, Annual Population Survey, 2010, https://www.nomisweb.co.uk

The working age population in 2009 had the following qualifications:

- 27.3% NVQ4 and above;
- 43.5% NVQ3 and above;
- 60.8% NVQ2 and above;
- 73.6% NVQ1 and above;
- 7.7% other qualifications; and
- 14.8% no qualifications. [82]

In 2008/09, Wales had 1,886 schools;

- 28 nursery (1,800 students);
- 1,478 primary (258,300 students);
- 223 secondary (205,400 students);
- 44 special (4,100 students); and
- 53 pupil referral units (500 students).[83]

National Socio-Economic

In 2008 Wales' per capita Gross Value Added (GVA) was 15,237.[84]

In 2009 the median full-time gross hourly pay in Wales was £11.29 (males' median being £12.02 and the female median being £10.36). This compares to £10.79 in 2008 and represents growth of 4.6% in nominal hourly total full time pay over the previous year. [85]

In 2009 Wales had a total of 1,345,000 jobs.[86]

In Jan 2009 - Dec 2009, Wales had an unemployment rate of 8.4% (all people of working age). This

[83] DCSF, Education and Training Statistics for the United Kingdom: 2009, http://www.dcsf.gov.uk/rsgateway/DB/VOL/v000891/Chapter1.xls
[84] Regional, sub-regional and local gross value added 2009, http://www.statistics.gov.uk/pdfdir/gva1209.pdf
[85] NOMIS, Official Labour Market Statistics, Annual survey of hours and earnings - resident analysis https://www.nomisweb.co.uk/output/dn87000/{AFB7B1A5-142C-4D4F-BDE2-467C1389CB90}/nomis_2009_08_20_160703.xls
[86] ONS https://www.nomisweb.co.uk/reports/lmp/gor/2013265930/report.aspx

compares to the previous year when it had an unemployment rate of 6.5%.[87]

Output of the Welsh economy rose by 3% between 2007 and 2008[88]

Northern Ireland

National Demographic

In mid 2008 the resident population of Northern Ireland was 1,170,400 and 65.94% of the population were of working age (49.73% males and 50.25% females). [89]

In 2009 the economic activity of the working age population was broken down as follows:

- 69.9% of working age population is economically active.
- 65.1% of working age population is in employment.
- 6.8% of working age population is unemployed. [90]

In 2009 the working age population had the following qualifications:

- 25.4% had NVQ4 and above;
- 40.2% had NVQ3 and above;
- 55.2% had NVQ2 and above;
- 65.7% have NVQ1 and above;
- 5% had other qualifications; and
- 22.3% have no qualifications.[90]

Between 2007/08 to 2008/09 violence against the person declined by 0.4%, burglary increased by 6.6% and robbery increased by 12.2%. Theft of a vehicle declined by 11.5%, however all theft increased by 6.1%. Total crime in Northern Ireland overall increased by 1.5%.

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[87] NOMIS, Official Labour Market Statistics, National Indicators, June-August 2009, https://www.nomisweb.co.uk/articles/news/files/LFS%20headline%20indicators.xls
[88] Regional, sub-regional and local gross value added 2009, http://www.statistics.gov.uk/pdfdir/gva1209.pdf
[89] Office for National Statistics 2008 mid-year population estimates
[90] NOMIS, Official Labour Market Statistics, Annual Population Survey, 2010, https://www.nomisweb.co.uk

In 2008/09, Northern Ireland had 1,252 schools: 98 nursery (8,200 students); 873 primary (164,800 students); 223 secondary (148,000 students); 42 special (4,600 students); and no pupil referral units.[91] (Total of 323,300 pupils at maintained schools and no students at non-maintained schools). [91]

National Socio-Economic

In 2008 Northern Ireland's per capita Gross Value Added (GVA) was 16,188.[92]

In 2009 the median full-time gross hourly pay in Northern Ireland was £11.05 (males' median being £11.37 and the female median being £10.69). This compares to £10.27 in 2008 and represents growth of 7.6% in nominal hourly total full time pay over the previous year. [93]

In Jan 2009 - Dec 2009, Northern Ireland had an unemployment rate of 6.8% (all people of working age). This compares to the previous year when it had an unemployment rate of 4%.[94]

Output of the Northern Irish economy rose by 3% between 2007 and 2008.[92]

2.3.2 Sub-regional locations

Plymouth

Demographics:

In 2009 the Resident population of Plymouth was 256,700 (49.2% male and 50.8% female) and 67.2% were of working age (68.7% of all males were of working age and 65.9% of all females were of working age).

The working age population had the following economic activity in July 2009 to June 2010:

- 75.6% were economically active;
- 70.1% were in employment;
- 7.9% were unemployed.[95]

[91] DCSF, Education and Training Statistics for the United Kingdom: 2009, http://www.dcsf.gov.uk/rsgateway/DB/VOL/v000891/Chapter1.xls
[92] Regional, sub-regional and local gross value added 2009, http://www.statistics.gov.uk/pdfdir/gva1209.pdf
[93] NOMIS, Official Labour Market Statistics, Annual survey of hours and earnings - resident analysis https://www.nomisweb.co.uk/output/dn87000/{AFB7B1A5-142C-4D4F-BDE2-467C1389CB90}/nomis_2009_08_20_160703.xls
[94] NOMIS, Official Labour Market Statistics, National Indicators, June-August 2009, https://www.nomisweb.co.uk/articles/news/files/LFS%20headline%20indicators.xls

[95] NOMIS, official labour market statistics, Plymouth, https://www.nomisweb.co.uk/reports/lmp/la/2038431908/report.aspx

Of those of working age in Plymouth in 2009:

- 24.2% had NVQ4 and above;
- 48.6% had NVQ3 and above;
- 66.7% had NVQ2 and above;
- 83% had NVQ1 and above;
- 8.6% had other qualifications; and
- 8.4% had no qualifications. [95]

There were 67 recorded crime BCS comparator offences per 1,000 population in 2007/08 (54 average for England and Wales).[96]

In May 2010, Plymouth had 97 schools, which consisted of the following:

- 2 nursery (194 students);
- 68 primary (18,702 students);
- 16 secondary (17,982 students);
- 8 special (607 students); and
- 3 pupil referral units (159 students).[97]

Socio-economics:

In 2009, per capita GVA in Plymouth was £16,479. This trend has shown a steady year-on-year increase, up from £11,848 in 2000. The per-head GVA index is 80.2, compared to the UK baseline of 100 and an index of 82.8 for the area in 2000.[98]

In the period July 2009 - June 2010, the average full-time gross hourly pay in Plymouth was £11.77 (compared to a national average of £12.65). This compares to £9.75 in 2007 for the area (and a national average of £11.51).

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[96] Home Office, Crime Statistics, Local Authorities: Recorded crime for seven key offences and BCS comparator 2006/07 to 2007/08 http://www.homeoffice.gov.uk/rds/pdfs08/laa1b.xls

[97] Plymouth City Council, website, http://www.plymouth.gov.uk/schoolsfactsandfigures

[98] ONS, Regional, sub-regional and local gross value added (GVA), December 2008, http://www.statistics.gov.uk/pdfdir/gva1210.pdf

Between January and December 2009 and July 2009 – Jun 2010, Plymouth had an average unemployment rate of 7.9% compared to a UK average of 7.7%. This compares to January to December 2008, when Plymouth had an average unemployment rate of 5.7% compared to a UK average of 5.7%.

Plymouth has a total of 106,900 jobs with a job density[99] of 0.74 (compared to 0.82 in the South West and 0.79 in Great Britain).

The Naval Base is the largest in Western Europe, and accounts for 10% of Plymouth's income.

Plymouth has a strong and recognisable industrial and military heritage which has left behind a set of ongoing and evolving specialisms in Advanced Engineering and Maritime and Marine industries.[100] However, in recent years there has been a decline in employment in technology and knowledge based activities in Plymouth.[100] The Economic Strategy identifies that a more diverse business base is important to Plymouth's future economic development. [100]

Plymouth experienced a large loss of high skilled and high paid jobs from the dockyard in the 1970's and 1980's. Although there was some recovery by attracting overseas manufacturing, these jobs were not as skilled and attracted lower pay. [100]

[99] The density figures represent the ratio of total jobs to working-age population. Total jobs includes employees, self-employed, government-supported trainees and HM Forces.

[100] Plymouth City Council, Plymouth Local Economic Strategy 2006-2021. http://www.plymouth.gov.uk/homepage/business/businessandinvestment/localeconomicstrategy.htm

Fife

Demographics

In 2009 the resident population of Fife was 363,500 (48.3% male and 51.7% female) [101] and 64.8% of population is of working age (65.8% of males and 63.9% of females). [101]

The working age population had the following economic activity in 2009:

- 78.4% were economically active;
- 71% were in employment;
- 8% were unemployed. [101]

Of those of working age in Fife in 2009:

- 34.2% had NVQ4 and above;
- 55.1% had NVQ3 and above;
- 71.2% had NVQ2 and above;
- 82.2% had NVQ1 and above;
- 7.8% had other qualifications; and
- 10% had no qualifications. [101]

The crime rate is not significantly different to the Scottish average. [102]

Total crime per 10,000 population in 2005-06 was 850. [103]

Fife Council's education services provide for over 55,000 pupils in 142 primary schools, 19 secondary

[101] NOMIS, official labour market statistics, Fife, https://www.nomisweb.co.uk/reports/lmp/la/2038432135/report.aspx?town=fife

[102] Scotland Public Health Observatory, Health and Wellbeing Profile 2008,

http://www.scotpho.org.uk/home/Comparativehealth/Profiles/chp_profiles.asp

[103] Scottish National Statistics, http://www.sns.gov.uk

schools, 16 stand-alone nurseries and six special schools. [104]

Socio-economics

In 2009, per capita GVA in Fife and Clackmannanshire was £14,539. This trend has shown a steady year-on-year increase, up from £10,439 in 2000.[105] The per-head GVA index is 70.8, compared to the UK baseline of 100 and an index of 73.0 for the area in 2000.

In 2009 the median full-time gross hourly pay in Fife was £11.89 (compared to a national median of £12.47). This compares to £11.67 in 2008 for the area (and a national median of £12.01).

In January - December 2009 Fife had an average unemployment rate of 8% compared to a Great British rate of 7.7%. This compares to January - December 2008, when Fife had an unemployment rate of 5.7% compared to a British rate of 5.7%.

Fife is more dependent on manufacturing-intensive occupations for employment than Scotland as a whole but is seeing a shift to a more modern service economy. Specialist manufacturing in defence, marine engineering and electronics remain important. But the legacy of vacant industrial property is giving way to modern offices, financial services and call centres.[106]

Fife has a total of 130,300 jobs with a job density of 0.61 (compared to 0.8 in Scotland and 0.79 in Great Britain).

In 2009 Fife had a lower percentage of the workforce employed in: transport, communications, finance and IT than either Scotland or Great Britain. Fife had a high percentage of the workforce employed in public administration, education, health, manufacturing and other services compared to Scotland or Great Britain.

[104] Audit Scotland, Fife Council, Audit of Best Value and Community Planning, March 2009, http://www.audit-scotland.gov.uk/docs/local/2009/bv_090312_fife_em.pdf

[105] ONS, Regional, sub-regional and local gross value added (GVA), December 2009, http://www.statistics.gov.uk/pdfdir/gva1210.pdf

[106] Fife Council, Single Outcome Agreement, 2009-2012, Fife Council, Single Outcome Agreement

2.4 Existing problems

2.4.1 National

UK

The UK population continues to grow; however, there is a decline in those of working age and competition from the civil sector for those with requisite civil or defence-related nuclear skills and experience. This may affect when and where the SDP's radiological activities can feasibly take place.

The UK economy is currently in recovery; however unemployment rates have been rising and may continue to rise beyond 2010. Disadvantage continues to exist in many communities, both in remote areas and inner cities.

Budget constraints may affect current delivery plans, in line with the situation for wider national and local government.

Defence activity generally brings positive economic impacts around its facilities and bases, due to relatively stable employment levels and inward investment

2.4.2 Sub-regional locations

Plymouth

Plymouth has relative lower wages than the UK averages. Plymouth has a strong and recognisable industrial and military heritage which has left behind a set of ongoing and evolving specialisms in Advanced Engineering and Maritime industries. However, in recent years there has been a decline in employment in technology and knowledge based activities in Plymouth.

Fife

Fife has relatively lower wages than UK average and is more dependent on manufacturing than Scotland as a whole, but is seeing a shift to a more modern service economy. Specialist manufacturing in defence, marine engineering and electronics remain important.

2.5 Likely evolution of the baseline

2.5.1 National

UK

Demographic

The current UK population is generally increasing, and projected to reach 71.6 million by 2033. [107]

The age structure of the UK population is moving towards an ageing population: those of pensionable age are projected to increase from 19.2% in 2008 to 21.8% of the population by 2033 (note that the pensionable age is to change over this period). Those aged between 15-64 years are projected to decrease from 62.1% to 60.5% of the population, whilst those under 16 are projected to decrease from 18.7% to 17.9% of the population by 2033. [107]

There are no formal targets for population growth in the UK (other than the recent intention to introduce non-EU immigration caps).

MOD targets to reach 8% ethnic minority representation in the Armed Forces by 2013 (existing MOD commitment).[108] MOD targets to reach 15% women representation in the Senior Civil Service (SCS) by 2009 (existing MOD commitment).[108] In 2009, 9.5% of the military workforce was female.[109]

Socio-Economic

Gross Domestic Product rose by 1.2 per cent in the second quarter 2010 due to strong rebound in construction output from the weather-affected level in the first quarter, and a pick up in services sector growth. This is despite the negative impacts of the volcanic ash cloud and industrial action in the air transport sector. In the labour market, employment rose in the second quarter of the year, but remains below pre-recession levels and rates. There is evidence of a strong rise in part-time employment through the recession, with self-employment also strengthening during 2009. Recent output increases have been partly delivered through higher labour productivity. [110]

DCLG aims to raise the productivity of the UK economy, maximise job opportunities for all and improve

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[107] ONS, National Population Projections 2008-based, http://www.statistics.gov.uk/pdfdir/pproj1009.pdf
[108] MOD, Sustainable Development Report and Action Plan, 2008, http://www.mod.uk/NR/rdonlyres/D8407A1C-CA68-4AD4-8E17-9F71B151AF6A/0/SusDevReport2008.pdf
[109] MOD Annual Report and Accounts Volume One 2008-2009 Annual Performance Report, http://www.mod.uk/NR/rdonlyres/0981769C-D30A-469B-B61D-C6DC270BC5C5/0/mod_arac0809_vol1.pdf
[110] ONS, Economic & Labour Market Review (Vol.4, no. 9) September 2010 http://www.statistics.gov.uk/downloads/theme_economy/EconReview_0910.pdf

the economic performance of all English regions and reduce the gap in economic growth rates between regions.[111]

The UK Government aims to raise the rate of the UK's productivity growth over the economic cycle and narrow the productivity gap with our major industrial competitors.[112]

England

Demographic

Between 2008 and 2033, the population of England is projected to increase from 51.46 million to 60.715 million, an increase of 17.9%. The number of children aged under 16 is projected to increase by 12.8% from 9.669 million in 2008 to 10.916 million by 2033; the number of people of working age is projected to increase by 7.7% from 33.503 million in 2008 to 36.101 million; the number of people of pensionable age is projected to rise by 65.2% from 8.289 million in 2008 to 13.697 million.[113]

Socio-Economic

No GDP values for England were available but trends will closely match that of the UK as a whole.

Scotland

Demographic

Between 2008 and 2033, the population of Scotland is projected to increase from 5.17 to 5.84 million. The number of children aged under 16 is projected to decrease by 1.5% from 0.91 million in 2008 to 0.9 million by 2033; the number of people of working age is projected to increase by 2.1% from 3.24 million in 2008 to 3.31 million; the number of people of pensionable age is projected to rise by 23.9% from 1 million in 2008 to 1.34 million.[114]

Scotland has a population target of matching the average European (EU15) population growth over the period from 2007 to 2017. Population growth in 2008 was slower than that of the EU 15 countries, and the gap in annual growth rates has increased.[115]

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[111] DCLG, Planning Policy Statement 4: Planning for Sustainable Economic Growth
[112] HM Government, PSA Delivery Agreement 1: Raise the Productivity of the UK Economy
[113] General Register Office for Scotland population projections, http://www.scotpho.org.uk/home/Populationdynamics/Population/DataPagesofPopulation/Population_scotprojections.asp
[114] General Register Office for Scotland population projections, http://www.scotpho.org.uk/home/Populationdynamics/Population/DataPagesofPopulation/Population_scotprojections.asp
[115] Scottish Government, http://www.scotland.gov.uk/About/scotPerforms/purposes/population

Socio-Economic

In Scotland GDP fell by 3.5 per cent annually and remained unchanged during the first quarter of 2010 (seasonally adjusted). In the year to end-March 2010, the Scottish service sector fell by 2.4 per cent, the production sector fell by 7.1 per cent and the construction sector fell by 8.3 per cent. In the first quarter of 2010, the service sector fell by 0.2 per cent, the production sector remained unchanged and the construction sector grew by 2.8 per cent.[116]

The key targets for Scotland in terms of economic development to 2017 are:

- to match the GDP growth rate of the small independent EU countries;
- to raise Scotland's GDP growth rate to the UK level by 2011;
- to rank in the top quartile for productivity amongst our key trading partners in the OECD;
- to maintain our position on labour market participation as the top performing country in the UK and close the gap with the top 5 OECD economies;
- to match average European (EU-15) population growth over the period from 2007 to 2017, supported by increased healthy life expectancy in Scotland over this period;
- to increase overall income and the proportion of income earned by the three lowest income deciles as a group, and;
- to narrow the gap in participation between Scotland's best and worst performing regions.[117]

Wales

Demographic

The population of Wales is projected to increase to 3.35 million by 2033 (a 12 per cent increase). Although more births than deaths are projected throughout most of the projection period, net inward migration is the main reason for projected population growth. The number of children is projected to decrease slightly during the first five years of the projection period, with around one per cent less children in 2013 than in 2008. This is because the projected decrease in the number of older children is greater than the increase in the number of young children during the next few years. The number of pensioners is projected to increase during most of the projection period despite the change to state

[116] Scottish Government Statistics, High Level Summary of Statistics, Economy, April 2010, http://www.scotland.gov.uk/Resource/Doc/933/0102344.pdf
[117] Scottish Government, Government Economic Strategy, http://www.scotland.gov.uk/Resource/Doc/202993/0054092.pdf

pension age. It is projected that there will be 185,000 (29 per cent) more pensioners in 2033 than in 2008. The population of Wales will become gradually older with the median age of the population rising from 41.1 years in 2008 to 44.2 years in 2033. [118]

Socio-Economic

In Wales production output for the four quarters ending Q1 2010 fell by 10.1 per cent compared with the previous four quarters. Production output for quarter 1 2010 rose by 5.2 per cent compared with the previous quarter. The figure for the same period for the UK rose by 1.0 per cent. Manufacturing output in Wales for the four quarters ending Q1 2010 fell by 9.7 per cent compared with the previous four quarters. Manufacturing output for quarter 1 2010 rose by 5.7 per cent compared with the previous quarter. The UK index rose by 1.4 per cent over the same period. For the four quarters to quarter 2 2010, the value of exports of goods from Wales fell by 15.6 per cent on the previous four quarters and rose by 35.5 per cent over 1999. Exports to EU countries accounted for 56 per cent of the total in the latest four quarters, compared to 52 per cent in the previous four quarters. Wales had the lowest level of GVA per head in the UK regions.[119]

The key economic development targets for Wales to 2010 are to:

- increase net employment Raise by 175,000;
- increase net employment in Finance and Business services Raise by 20,000;
- increase stock of VAT registered businesses per 10,000 persons of working age Raise to 93% of UK average;
- increase business enterprise R&D expenditure as a % of GDP Raise to >1% 0.4%;
- growth in the value of exports Match UK growth;
- increase the proportion of Welsh businesses using e-commerce Match UK average proportion;
- increase household disposable income per head of the population to 95% of UK average;
- increase tourism expenditure in Wales by an average of 6% per annum over period;
- reduce the proportion of adults of working age without qualifications to 1 in 10, and;

[118] Welsh Assembly Government 2008-based National Population Projections, http://wales.gov.uk/topics/statistics/headlines/pop2009/hdw20091021/?lang=en
[119] Statistics for Wales, Key Economic Statistics, September 2010, http://wales.gov.uk/docs/statistics/2010/100917sb772010en.pdf

- increase the proportion of adults of working age with a level 4 qualification to over 3 in 10.[120]

Northern Ireland

Demographic

In Northern Ireland, the population is projected to increase to 1,985,800 between 2008 and 2033 (an increase of 11.9%). The proportion of the population that is children under the age of 16 is projected to decrease from 21% of the total population in 2008 to 19% in 2033; the adult population (between the ages of 16 and 64) is also projected to decrease from 65% to 59% of the total population between 2008 and 2033 whilst the elderly population is projected to increase from 14% to 22% of the total population.[121]

Socio-Economic

Provisional results for the Northern Ireland Index of Production for the first quarter of 2010 show that output levels increased over the quarter in real terms (1.5%). This is the first quarter to report an increase after peaking in Q2 2008. Over the year NI Production levels fell by 1.9%. Manufacturing comprises the main element of the production index. Manufacturing output for Q1 2010 recorded a rise of 1.1% compared to the previous quarter. NI recorded a decrease of 2.8% in manufacturing output compared to the same period one year earlier. Over the latest four quarters NI manufacturing output decreased by 10.2% compared to the previous four quarters. Three of the six broad manufacturing subsectors reported an increase over the quarter, the remainder reported a decrease. Quarter 1 2010 manufacturing productivity increased by 1.4% over the quarter and by 2.8% compared to the same quarter one year earlier.

For Northern Ireland, the main economic development related objectives are to:

- increase awareness of the sector and establish its value to the local economy;
- develop the sector and increase its business strength; and create a supportive and enabling environment.[122]

[120] Welsh Assembly Government; Wales, A Vibrant Economy, http://new.wales.gov.uk/deet/publications/bande/wave/wavee.pdf?lang=en
[121] Northern Ireland Statistics and Research Agency, 2008-based population projections, http://www.nisra.gov.uk/archive/demography/population/projections/popproj08.pdf
[122] DETINI, Social Economy Enterprise Strategy 2009 – 2011, http://www.detini.gov.uk/social_economy_enterprise_strategy_2009-2011.pdf

2.5.2 Sub-regional locations

Plymouth

Demographics

Plymouth’s population has shown some fluctuation over the 1981-2006 period. From a baseline of 253,000 people in 1981, in 2006 Plymouth had witnessed a slight (2.05%) reduction in total population to 248,100. In contrast, the South West had an 15.6% increase in population over the 1981 to 2005 period (4,383,400 in 1981 to 5,067,800 in 2005) and there has also been a 7.7% increase in population nationally (46,820,800 in 1981 to 50,431,700 in 2005). The pattern of male and female populations within Plymouth has fluctuated in line with the city total over the period.[123]

Plymouth has an increasing trend in the percentage of students gaining five or more GCSEs (A*-C) from 53% in 2003 to 59.4% in 2006. Plymouth has witnessed a small increase in the percentage of working age population qualified to NVQ level 4 from 18.4% in 1999 to 19.3% in 2006.[123]

Plymouth schools are currently facing: a sharp and continuing decline in pupil numbers; an increasing number of surplus places especially in primary schools; and a large proportion of the school building stock, built mostly in the 1950s and 60s, in poor condition, needing replacement or significant refurbishment.[124]

Plymouth's population is projected to rise to 263,900 by 2025 which represents a projected increase of 7.2% from 2005.[125]

The projected rise in population to 2025 will not be uniform across the age groups. The percentage of the population that is under 14 will fall by 0.4%, those 15-24 will fall by 8.7%, the rise in the 25-64 age band will slow, but the percentage of over 65s will increase by 40%.[125]

Plymouth has projected increases in jobs of 42,500 from 135,604 in 2003 to 178,104 by 2026.[126]

Crime trends in Plymouth as judged by the rate of BCS comparator crime have fallen slightly from 75.1 per 1,000 in 2003/04 to 74.9 per 1,000 in 2006/07. However, during this period fluctuations have been evident. The rate of recorded burglary in Plymouth fell from 18.0 per 1,000 in 1999/2000 to 11 per 1000

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[123] Plymouth’s Sustainable Community Strategy 2007-2020, http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm
[124] Plymouth City Council, http://www.plymouth.gov.uk/homepage/education/schools/schoolimplementationplan.htm
[125] Plymouth's Health, Social Care and Well-being Strategy 2008-2020
[126] Plymouth Local Economic Strategy 2006 - 2021 & Beyond

in 2006/07 although it has fluctuated during this period.[127]

In 2008-09 local crime mapping figures suggest that the overall crime levels in Plymouth have continued to fall.[128]

South West Regional Development Agency targets Bristol, Plymouth, Swindon, Exeter and the key Cornish towns in terms of improving transport infrastructure, making city centres more attractive, linking deprived areas to the opportunities provided by growth, enhancing the knowledge base of our businesses, building more affordable homes and increasing the skills and knowledge of our people.[129]

The Plymouth 2020 Partnership sets floor targets including to substantially reduce mortality rates by 40% from heart disease and 20% from cancer by 2010 and 60% of 16 year olds to achieve 5 GCSE A* - C by 2008. [130]

Socio-Economic

Plymouth's GVA per head indexed, with UK =100 showed a downward trend between 1999 and 2007 decreasing from 84 to 82[131]

The recent economic downturn has affected Plymouth and a recovery is likely to be in line with national predictions.[132]

Employment rate trend in Plymouth between 1999 and 2005 fluctuated but overall was relatively static.[132] Unemployment is expected to increase as a result of the recent economic downturn. A recovery is likely to occur in line with national trends.[133] Plymouth aims to increase its number of available jobs to 178,104 by 2026.[133]

Plymouth CC aims that by 2016:

- GVA per head in Plymouth to be 100% of UK average (from 90% of UK average in 2002).
- an employment rate of 80% (73% in 2004).

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[127] Plymouth's Sustainable Community Strategy 2007-2020, http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm
[128] Devon and Cornwall Constabulary, Local Crime Mapping 2008-09, http://maps.devon-cornwall.police.uk/map/plymouth-1/
[129] SWRDA, The Way Ahead Delivering Sustainable Communities in the South West.
[130] Plymouth 2020 Partnership, Neighbourhood Renewal Strategy
[131] Sub Regional skills and employment analysis 2010 Plymouth, http://www.swslim.org.uk/downloads/lesbs/plymouth.pdf
[132] Plymouth's Sustainable Community Strategy 2007-2020, http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm
[133] Plymouth City Council, Employment Land Review, http://www.plymouth.gov.uk/homepage/environmentandplanning/planning/planningpolicy/ldf/ldfbackgroundreports/bremploymentlandreview.htm

- to have a VAT registered business stock per 1,000 of 210 (163 in 2004).
- to have only 9% of workforce with no qualifications (12.5% in 2004).
- to have 35% of workforce with NVQ Level 4 qualifications (21% in 2004).
- a 2% increase in employment year on year until 2016 and reduction in the economic inactivity rate to 19%. [134]

Fife

Demographics

Fife is an area with a growing population which has reached at least 375,000 and is still expanding.[135] The General Register Office for Scotland (GROS) predicts that Fife's population will grow by 10.1% to 398,608 in 2033.against a growth of 7.3% for Scotland.[136]

Total crime rates per 10,000 population have gradually increased from 660 in 1997-08 to peak in 2004-05 at 983 before starting a declining trend to 665 in 2008-09.[137]

Socio-economic

In Fife, there is a trend of the legacy of vacant industrial property is giving way to modern offices, financial services and call centres.[138] Between 1998 and 2008 employment sectors have shifted away from manufacturing towards increased employment in the service industries and public administration, education and health.[139]

Between 2001 and 2008, the employment rate has fluctuated but shows a gradually increasing rate. The rate was 72.4 in 2001 (with a peak of 77.9 in 2004) and ending on 76.5 in 2008.[139] This is unlikely to continue under recession conditions.

Fife Council sets out the following key economic targets:

- increase the number of employees in medium and large enterprises by 10% (6,000 jobs);

[134] Plymouth Local Economic Strategy 2006 - 2021 and Beyond
[135] Fife Council, Fife Structure Plan 2006-2026
[136] General Register Office for Scotland, 2008-based Population Projections.
[137] Scottish National Statistics, http://www.sns.gov.uk
[138] Fife Council, Single Outcome Agreement, 2008-2011, http://www.improvementservice.org.uk/library/577-single-outcome-agreements/666-single-outcome-agreements-2008-2011/view-category/-1/
[139] Scottish National Statistics, http://www.sns.gov.uk

- 80% of the working age population in employment;
- attract private sector investment through Invest in Fife of £550m;
- double the amount of business expenditure in research and development to £36m;
- grow Fife's tourism sector revenue by 20% (£51m); and
- increase the number of people employed in green jobs by 2,000. [140]

2.6 Assessment objective, guide questions and significance

The objective and guide questions related to population and socio-economics that have been used in the assessment of the effects of the SDP are set out in Table 2.2, together with reasons for their selection.

Table 2.2 Approach to assessing the effects of SDP on topic

Objective/guide question	Reasoning
Objective: Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts.	The SDP proposals could contribute to sustainable economic growth and positive social impacts within the community.
Will the SDP Proposals affect the social infrastructure and amenities available to local communities?	Any development has the potential to impact on the local social infrastructure and amenities which could affect the quality of life of individuals in the community.
Will the SDP Proposals affect local population demographics and/ or levels of deprivation in surrounding areas?	Changes to local population demographics have the potential to impact on local economy and demand for community facilities such as healthcare, education and recreation. Changes to these factors may alter the levels of deprivation in the area.
Will the SDP Proposals affect opportunities for investment, education and skills development?	Investment, education and skills development are vital for economic growth.

[140] Fife Council, Growing Fife's Future - Fife's Economic Strategy 2009-20

Objective/guide question	Reasoning
Will the SDP Proposals affect the number or types of jobs available in local economies?	Affecting the number or type of jobs will have influences on the local economy and productivity. National strategies such as Framework for Economic Development in Scotland include targets on increasing productivity and proportion of green jobs (e.g. – Green Jobs Strategy for Wales).
Will the SDP Proposals affect how diverse and robust local economies are?	A diverse and robust economy is important to ensure economic growth, this is especially relevant given the uncertain nature of climate change and its potential impacts.
Will the SDP Proposals affect the sense of positive self-image and the attractiveness of surrounding areas as places to live, work and invest in?	Increasing the image and attractiveness of an area will increase the motivation for investment which would contribute to local economic growth.

Table 2.3 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the population objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 2.3 Approach to determining the significance of effects on population

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option will incorporate the provision of social infrastructure and amenities. • Option will provide educational services/facilities and offer long term opportunities for skills development including, for example, apprenticeship schemes. • Option will generate in excess of 100 full time equivalent (FTE) employment opportunities per annum, a large proportion of which will benefit the local community. • Option will generate significant investment in local supply chains fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy (e.g. through the procurement of local contractors to undertake construction activities). • Option will significantly enhance the attractiveness of the area to existing and prospective residents and businesses (e.g. through the generation of employment opportunities and provision of infrastructure).

Effect	Description	Illustrative Guidance
+	Positive	• Option may stimulate limited investment in existing services and amenities (e.g. associated with any increase in the work place population). • Option will provide some educational opportunities and skills development including, for example, apprenticeship schemes. • Option will generate some full time equivalent (FTE) employment opportunities per annum which may benefit the local community. • Option will generate limited investment in local supply chains (e.g. through the procurement of local contractors to undertake construction activities). • Option will generate savings by reducing national public expenditure associated with afloat storage. • Option will enhance the attractiveness of the area to existing and prospective residents and businesses (e.g. through the generation of employment opportunities and provision of infrastructure).
0	No (neutral effects)	• Option will not affect social infrastructure and amenities available to local communities. • Option will not affect the provision of educational services/facilities or offer opportunities for skills development. • Option will not affect any local employment opportunities/increase local unemployment rates. • Option will have no effect on wider economic benefits/undermine the growth and diversity of the local economy. • Option will not affect the attractiveness of the area to existing and prospective residents and businesses.
-	Negative	• Option will cause some disruption to existing services and amenities available to local communities which is likely to be felt in the short term. • Option will lead to a minor increase in local unemployment (e.g. due to the cessation of some activities or rationalisation of activities on sites) • Option will reduce the resilience and diversity of the local economy (e.g. through loss of local supply chain opportunities). • Option will reduce local investment in an area affect growth of local economy. • Option will undermine the attractiveness of the area to existing and prospective residents and businesses (e.g. as due to impacts arising from construction activities or concerns regarding the radioactive element of SDP). • Option will undermine the quality of life of the local population (e.g. due to noise and vibration associated with HGV movements during construction or operation of facilities) such that some complaints could be expected.

Effect	Description	Illustrative Guidance
--	Significant negative	• Option will result in the loss of existing services and amenities available to local communities (e.g. where development is proposed on a site in community use). • Option will lead to a significant and sustained increase in local unemployment (e.g. due to the closure of sites). • Option will significantly reduce the resilience and diversity of the local economy (e.g. through significant loss of local contracts and supply chain opportunities). • Option will lead to a significant reduction in investment in an area that will affect the growth of local economy (e.g. directly through substantial reduction is sites and activities, and indirectly through causing businesses to relocate out of the area). • Option will significantly undermine the attractiveness of the area to existing and prospective residents and businesses (e.g. as due to impacts arising from construction activities or concerns regarding the radioactive element of SDP). • Option will seriously undermine the quality of life of the local population (e.g. due to noise and vibration associated with HGV movements during construction or operation of facilities) such that the project and Local Authority would be likely to experience a considerable number of complaints.
?	Uncertain	• From the level of information available the impact that the option would have on this objective is uncertain.

2.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the population objective. **Table 2.4** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 2.4 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in the **Table 2.5**.

Table 2.5 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than

Category	Assumption Description
	'greenfield' sites, although it is recognised that 'brownfield' land can be important for conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m^2. Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2 . As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average).

Category	Assumption Description
	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine • It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since recycling a cleared submarine is little different to recycling a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be

Category	Assumption Description
	transported from the initial dismantling facility to the interim storage facility by sea, rail or road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Table 2.4** are considered in-turn below.

Stage I: Design and Develop the Initial Submarine Dismantling Facilities

Population

Option 1: Develop a Greenfield Site for Initial Submarine Dismantling

Assessment of Effects:

Construction of an initial dismantling facility on greenfield land will require development of supporting ancillary facilities and infrastructure including, for example roads, an administration office and stores. Construction of this scale on greenfield land may require transport infrastructure (such as roads or rail spur) or enhancements to the existing transport network to accommodate the demands of construction traffic. If such improvements or additions were not deemed appropriate, there may then be a potential negative effect, particularly on local road networks (and users) in view of the need for large material movements. However, within the context of a project lasting decades, these effects would only be expected to be within the short term (i.e. considerably within the five year definition of short term as applied to this project) and given the coastal location of the development, it would be expected that much of the movement of construction material would be by sea to minimise disruption to users of existing transport networks. Nonetheless, for those individuals or communities that experience disruption, it is recognised that this may not be the perception.

It is not expected that the proposed development under this option would incorporate the provision of new community facilities/amenities and temporary job opportunities related to construction activities would not be of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing.

The number of employment opportunities to be generated during the construction of initial dismantling facilities is likely to be significant (i.e. in excess of 100 FTEs per annum) and greater than for Options 2 and 3, reflecting the scale of works under this option. However, the potential for these posts to directly benefit the local community would depend on the balance between skilled and unskilled construction posts required and the availability of individuals in the local labour market with those skills and relevant experience. It would also depend on the recruitment policies of the contractors employed to undertake the work and unless clear contract direction was given to ensure that members of the local community were given preference, the temporary employment opportunities created through the construction phase may not benefit the local community to any substantial extent.

There may be potential to ensure the construction offers training opportunities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from the National Apprenticeship Service (NAS).

It is assumed that a significant proportion of SDP expenditure will be related to construction activities. Extensive construction works and associated expenditure may increase investment in local supply chains fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. The extent to which these effects would be locally significant will depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. It is envisaged that these effects would only be felt in the short term but may impact upon both the local and regional economy (depending on lead contractor practice, where the site is actually located and the scale of the regional economy). There may also be local economic benefits associated with construction worker spend (in terms of temporary accommodation, consumables and entertainment). However, the extent of this will be dependent on the approach to contractor recruitment and the proportion of construction workers who will need temporary accommodation. Whilst construction will incur significant costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net benefit in relation to national public expenditure.

Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). These effects may be significant in areas where there are existing quality of life issues. However, the effects on this aspect of the objective are deemed to be uncertain until the location(s) of the initial dismantling facilities has been identified.

There is the potential for construction to affect the attractiveness of the surrounding areas to existing and prospective residents and businesses. Short term effects principally relate to the impact of construction activities on visual amenity, noise, vibration and dust caused by, for example, the operation of plant equipment such as cranes and HGV movements. However, as these effects are expected to be only temporary it is not envisaged that they would have a significant effect on this aspect of the objective. Medium term effects are likely to relate to both the impact of development on the character of surrounding areas and how the presence of facilities would be perceived. Facilities of the scale and form required on a greenfield site could significantly undermine existing landscape/townscape character potentially resulting in changes to land value and property prices. However, the type and severity of effect is dependent upon their location with respect to the existing character of the surrounding area and the proximity of sensitive receptors. The radioactive waste element of site operation may also affect the attractiveness of

Stage I: Design and Develop the Initial Submarine Dismantling Facilities Population	
surrounding areas to residents and inward investment which may result in changes to land value and property prices. This is dependent on how the facilities are perceived. For example, the facilities may stimulate inward investment by attracting companies looking to take advantage of the new transport infrastructure provided to support operational activity and encourage inward migration through the generation of employment opportunities. Alternatively, the presence of a facility may lead to outward migration and disinvestment if concerns are held with respect to the safety of radioactive waste management. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As a result, positive effects, including the economic benefits associated with construction, and negative effects, including those related to the quality of life of local communities, may be reduced under RC/RPV options in the short term relative to the packaged waste storage option (which would require construction of all dismantling facilities 'up front'), reflecting the reduced scale of construction. However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling. Phasing development over two periods (as required for RC and RPV options) may also undermine the potential for wider economic benefits to be realised as development would not benefit from the economies of scale associated with the construction of a facility comprising all necessary components for RPV dismantling, size reduction and ILW packaging. However, phasing may also serve to keep levels of disturbance and emissions below threshold levels where they may have a negative effect on the quality of life of local communities (for example, air quality). **Proposed Mitigation / Enhancements Measures:** • Any opportunities to employ local contractors and individuals for works or for the use of local materials and suppliers should be identified, although due consideration and adherence to employment legislation is required (e.g. no discrimination on any grounds). Any potential to offer training opportunities (e.g. apprenticeship schemes) should be pursued. • Any increase in demand for services and accommodation arising from the works and its potential effect on the existing community should be considered carefully. • Close consultation with the local community regarding potential infrastructure improvements/enhancements is recommended to help ensure that local needs and wants are met. • Adopt high quality design principles in order to maintain the attractiveness of the surrounding area	
Summary: Option 1 is expected to generate a potentially significant number of employment opportunities which could benefit the local community. However, the extent to which these posts *do* directly benefit the local community will depend on the specific employment opportunities, the local labour market and the employment practices of the lead contractor. The capital investment in facilities could also have local (and potentially regional) economic benefits through use of the local supply chain. There will also be indirect economic benefits from the spend associated with the contractors employed to construct the facilities and there may be potential to ensure that construction offers training opportunities (e.g. apprenticeship schemes). Over the long term, it is expected that construction, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to the national economy. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from construction activities (e.g. associated with the increased noise, vibration and air quality effects from construction works and traffic), although it is deemed to be uncertain until the location of the initial dismantling facilities has been identified. There is potential for Option 1 to affect the attractiveness of the surrounding area as a result of the impact of the facility on landscape/townscape character and the potential for the radioactive waste element of the site's operation to be viewed negatively, although this is dependent on how facilities are perceived. For RC and RPV options construction of the size reduction facility would be delayed. This may reduce both positive and negative effects associated with construction in the short term relative to the Packaged Waste option (which would require	**++/-**

Stage I: Design and Develop the Initial Submarine Dismantling Facilities Population	
construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling.	

Option 2: Develop a Brownfield Site for Initial Submarine Dismantling

Assessment of Effects:

The type and range of effects identified in relation to Option 1 are expected to be similar for construction of initial dismantling facilities on a brownfield site. However, under this option it is envisaged that the majority of infrastructure required to accommodate development, including roads and rail spurs, would already be in place such that the impact of construction works on existing transport networks (and users) would be minor although for those individuals or communities that experience disruption, it is recognised that this may not be the perception.

As the majority of the supporting infrastructure would already be in place under this option and the scale of construction activity reduced, the number of employment opportunities and wider economic benefits generated by development of an initial dismantling facility on brownfield land are expected to be less than those associated with Option 1. Notwithstanding this, it is considered that the number of jobs created and potential for increased investment in local supply chains would still be significant subject to the type of posts created, the characteristics of the local labour market and the recruitment/procurement policies of the contractors employed to undertake the work as well as the requirements imposed by the MOD.

Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from construction activities on brownfield land (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). These effects may be significant in areas where there are existing quality of life issues (such as urban locations where it is assumed a brownfield site would be located either within or adjacent to) and may include, for example, Air Quality Management Areas (AQMAs).

It is assumed that the brownfield site taken forward for development would be located within or adjacent to an existing settlement and that development would be in keeping with its surrounds such that it is not envisaged that development would have a significant effect on the attractiveness of the surrounding area as a result of adverse impacts on landscape/townscape. However, it is acknowledged that brownfield sites may be sensitively located for example, within the open countryside, within a Conservation Area or in close proximity to sensitive receptors where development of the scale and form proposed under this option could have a significant negative effect on landscape/townscape character and the attractiveness of the surrounding area leading to changes in land values and property prices.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As a result, positive effects, including the economic benefits associated with construction, and negative effects, including those related to the quality of life of local communities, may be reduced under RC/RPV options in the short term relative to the Packaged Waste option (which would require construction of all dismantling facilities 'up front'), reflecting the reduced scale of construction. However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling.

Phasing development over two periods (as required for RC and RPV options) may also undermine the potential for wider economic benefits to be realised as development would not benefit from the economies of scale associated with the construction of a facility comprising all necessary components for RPV dismantling, size reduction and ILW packaging. However, phasing may also serve to keep levels of disturbance and emissions below threshold levels where they may have a negative effect on the quality of life of local communities (for example, air quality).

Proposed Mitigation / Enhancements Measures:

- No additional mitigation measures proposed above those set out for Option 1.

Summary: Option 2 is expected to generate a potentially significant number of employment opportunities which could benefit the local	**++/--**

Stage I: Design and Develop the Initial Submarine Dismantling Facilities

Population

community. However, the extent to which these posts *do* directly benefit the local community will depend on the specific employment opportunities, the local labour market and the employment practices of the lead contractor. The capital investment in the facilities could also have local (and potentially regional) economic benefits through use of the local supply chain. There will also be indirect economic benefits from the spend associated with the contractors employed to construct the facilities. There may also be potential to ensure that construction offers training opportunities (e.g. apprenticeship schemes).

Over the long term, it is expected that construction, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to the national economy.

Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). Although it is deemed to be uncertain until the location of the initial dismantling facilities has been identified, construction disturbance is likely to be more acute relative to the greenfield option if the brownfield land is already in a built-up area.

Option 2 may affect the attractiveness of the surrounding area primarily due to the potential for the radioactive waste element of the site's operation to be viewed negatively, although this is dependent on how facilities are perceived.

For RC and RPV options construction of the size reduction facility would be delayed. This may reduce both positive and negative effects associated with construction in the short term relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling.

Option 3: Develop an Existing Licensed/Authorised Site for Initial Submarine Dismantling

Assessment of Effects:

The type and range of effects on population associated with Options 1 and 2 are considered to be similar for this option. However, as Option 3 utilises existing sites Licensed or Approved by the UK nuclear regulators it is expected that such sites would provide existing infrastructure (including roads, rail spurs and docks) and the majority of ancillary facilities (for example, administration offices and stores) capable of accommodating initial dismantling facilities such that the scale of construction will be small relative to Options 1 and 2 and the magnitude of effects reduced.

Taking into account the scale of development proposed under this option, impacts on existing community facilities/amenities are expected to be minor and primarily related to the movement of construction materials to support development. Negative effects on the local road network (and users) could be generated by the movement of construction materials and the potential need for development of road improvements to accommodate construction traffic however, as the site would be coastally located, it would be expected that much of the movement of construction material would be by sea such that any disruption would be minimised. However, for those individuals or communities that experience disruption, it is recognised that this may not be the perception.

It is expected that construction on an existing Licensed/Authorised site would generate significantly less employment opportunities relative to Options 1 and 2 given that development is to predominantly comprise construction of the initial dismantling facilities. However, as the site would already be Licensed and likely to include activities similar to that proposed during operation, it is likely that there would be a local pool of appropriately skilled individuals to support the specialist aspects of construction. Consequently, whilst the number of jobs generated under this option would be lower than Options 1 and 2, there is a greater potential for these opportunities to benefit the local community.

Taking into account the scale of development required under this option, it is assumed that the total cost of construction would be significantly reduced relative to Options 1 and 2. Whilst this could result in reduced investment in local supply chains and lower levels of economic growth, it is likely that there will be specialist local suppliers who currently serve the existing site and may be able to support construction such that the local economic benefits derived from construction are maximised. It is envisaged that these effects would only be felt in the short term but may impact upon both the local and regional economy (depending on lead contractor practice where the site is actually located and the scale of the regional economy).

There is the potential that the construction may have a negative effect on the attractiveness of the surrounding areas to existing and prospective residents and businesses. Short term effects principally relate to the impact of construction activities on visual amenity, noise, vibration and

Stage I: Design and Develop the Initial Submarine Dismantling Facilities Population	
dust caused by, for example, the operation of plant equipment such as cranes and HGV movements. However, as these effects are expected to be only temporary, and in view of the scale of development proposed under this option, it is not envisaged that they would have a significant effect on this aspect of the objective. Long term effects are likely to relate to both the impact of development on the character of surrounding areas and how the presence of the facilities would be perceived. As the facilities would be located within an existing Licensed/Authorised site it has been assumed that development would be consistent with the character of the local area such that any effects would not be significant. However, the radioactive waste element of site operation may affect the attractiveness of surrounding areas which may in-turn result in changes to land value and property prices. This is dependent on how the facilities are perceived. On the one hand, as the facilities would be located within an existing site this may be viewed as a continuation of present use and consequently may therefore not affect how the local area is perceived. On the other hand, some may perceive this as unfairly adding to licensed activities already taking place within a locality further undermining the attractiveness of the area to both current and prospective residents and businesses. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As a result, positive effects, including the economic benefits associated with construction, and negative effects, including those related to the quality of life of local communities, may be reduced under RC/RPV options in the short term relative to the Packaged Waste option (which would require construction of all dismantling facilities 'up front'), reflecting the reduced scale of construction. However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling. Phasing development over two periods (as required for RC and RPV options) may also undermine the potential for wider economic benefits to be realised as development would not benefit from the economies of scale associated with the construction of a facility comprising all necessary components for RPV dismantling, size reduction and ILW packaging. However, phasing may also serve to keep levels of disturbance and emissions below threshold levels where they may have a negative effect on the quality of life of local communities (for example, air quality). **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Development of initial dismantling facilities under Option 3 will take place on an existing Licensed/Authorised site where infrastructure and ancillary facilities capable of accommodating the facilities will already be present. Whist the scale of construction activities would be reduced relative to Options 1 and 2 and, therefore, the number of construction related employment opportunities and potential expenditure less, as the site would already be Licensed and likely to include activities similar to that proposed for dismantling activities, it is considered that there may be a greater prospect for utilising local pools of appropriately skilled labour and suppliers. However, the extent to which development does generate local benefits will depend on the exact nature of the local labour market, the employment practices of the lead contractor and the presence of appropriate suppliers. There will also be indirect economic benefits from the spend associated with the contractors employed to construct the facilities and some potential to ensure that construction offers training opportunities (e.g. apprenticeship schemes). Over the long term, it is expected that construction, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to the national economy. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic), although it is deemed to be uncertain until the location of the dismantling and size reduction facilities has been identified. Option 3 may affect the attractiveness of the surrounding area primarily due to the potential for the radioactive waste element of the site's operation to be viewed negatively, although this is dependent on how facilities are perceived. For RC and RPV options construction of the size reduction facility would be delayed. This may reduce both positive and negative effects associated with construction in the short term relative to the Packaged Waste option (which would require	**+/-**

Stage I: Design and Develop the Initial Submarine Dismantling Facilities Population	
construction of all dismantling and size reduction facilities ‘up front’). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling.	

Stage II : Design and Develop the Interim ILW Storage Facilities

Population

Option 1: Develop a Greenfield Site for ILW Storage

Assessment of Effects:

The construction of the interim ILW storage facility on a greenfield site could include new transport infrastructure or enhancements to the existing transport network to accommodate the demands of construction traffic. If such improvements or additions were not deemed appropriate, there may then be a potential negative effect on existing transport infrastructure, particularly on local road networks (and users).

Construction of a interim ILW storage facility on a greenfield site is not assumed to include the provision of new community facilities/amenities. The temporary employment opportunities created by construction activities would not be of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing.

The number of employment opportunities to be generated during the construction of the interim ILW storage facility is likely to be significant (i.e. in excess of 100 FTEs per annum) and greater than for Options 2 and 3, reflecting the scale of works under this option. However, the potential for these posts to directly benefit the local community would depend on the balance between skilled and unskilled construction posts required and the availability of individuals in the local labour market with those skills and relevant experience. It would also depend on the recruitment policies of the contractors employed to undertake the work and unless clear contract direction was given to ensure that members of the local community were given preference, the temporary employment opportunities created through the construction phase may not benefit the local community to any substantial extent.

There may be potential to ensure the construction offers training opportunities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from the National Apprenticeship Service (NAS).

It is assumed that a significant proportion of SDP expenditure will be related to construction activities. Extensive construction works and associated expenditure may increase investment in local supply chains fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. The extent to which these effects would be locally significant will depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. It is envisaged that these effects would only be felt in the short term but may impact upon both the local and regional economy (depending on lead contractor practice, where the site is actually located and the scale of the regional economy). There may also be local economic benefits associated with construction worker spend (in terms of temporary accommodation, consumables and entertainment). However, the extent of this will be dependent on the approach to contractor recruitment and the proportion of construction workers who will need temporary accommodation. Whilst construction will incur significant costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net benefit in relation to national public expenditure.

Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). However, given the scale of construction activities associated with the development of a storage facility, these effects are unlikely to be significant although their severity may be increased in areas where there are existing quality of life issues and will be influenced by the technical option implemented.

There is the potential that the construction of an interim ILW storage facility and associated infrastructure may have a negative effect on the attractiveness of the surrounding areas to existing and prospective residents and businesses. Short term effects principally relate to the impact of construction activities on visual amenity, noise, vibration and dust caused by, for example, the operation of plant equipment such as cranes and HGV movements. Medium term effects are likely to relate to both the impact of development on the character of surrounding areas and how the presence of a storage facility would be perceived.

Technical Options:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6

Stage II : Design and Develop the Interim ILW Storage Facilities Population	
per submarine), plus supporting infrastructure. Storage of RCs will require construction of a relatively large facility. This reflects both the footprint of the facility and also the requirement for construction of supporting infrastructure which would include docking facilities. Consequently, the potential economic benefits associated with this option may be enhanced assuming that capital spend and the number of employment opportunities generated would also be greater. The increased scale and duration of construction activities under the RC option may increase the potential for, and magnitude of, negative effects on quality of life (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic) and the attractiveness of the surrounding areas to existing and prospective residents and businesses (due to the impact of construction activities on visual amenity, noise, vibration and dust). Moreover, the linear form of the vault area necessary to accommodate the storage requirements of RCs and use of heavy lift craneage (which would also be required for RPV storage) could impact on the character of the surrounding area in the medium term. Additional HGV movements associated with this technical option may also cause disruption to local transport networks (and users). However, under this technical option (and for RPV), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects). **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.	
Summary: Option 1 is expected to generate a potentially significant number of employment opportunities which could benefit the local community. However, the extent to which these posts *do* directly benefit the local community will depend on the specific employment opportunities, the local labour market and the employment practices of the lead contractor. The capital investment in the facility could also have local (and potentially regional) economic benefits through use of the local supply chain. There will also be indirect economic benefits from the spend associated with the contractors employed to construct the facility. There may also be potential to ensure the construction of the facility offers training opportunities (e.g. apprenticeship schemes). The level of economic benefit generated under this option may vary depending upon the type of storage facility constructed. Although this is currently uncertain, it is expected that storage of RCs, which will require construction of a relatively large facility compared to RPV and Packaged Waste options, will potentially generate the greatest economic benefits. Over the long term, it is expected that construction of an interim ILW storage facility as part of the wider SDP process will generate financial savings by reducing costs associated with current afloat storage. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from construction activities. The severity of these effects is dependent on the technical option taken forward and in this respect, the increased scale and duration of construction activities under the RC option may increase the potential for, and magnitude of, negative effects on quality of life (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). There is the potential that the construction of an interim ILW storage facility and associated infrastructure may have a negative effect on the attractiveness of the surrounding areas to existing and prospective residents and businesses. This potential may be increased under the RC option given the increased scale of construction activity in the short term and the scale/form of development once complete.	**++/-**
Option 2: Develop a Brownfield Site for ILW Storage	
Assessment of Effects: The type and range of effects identified in relation to Option 1 are expected to be similar for construction of an interim ILW storage facility on a brownfield site. However, under this option it is assumed that the majority of infrastructure required to accommodate development, including roads and rail spurs, would already be in place such that the impact of construction works on existing transport networks (and users) would be minor although for those individuals or communities that experience disruption, it is recognised that this may not be the perception.	

Stage II : Design and Develop the Interim ILW Storage Facilities **Population**	
As the majority of the supporting infrastructure would already be in place under this option and the scale of construction activity reduced, the number of employment opportunities and wider economic benefits generated by development of an initial dismantling facility on brownfield land are expected to be less than those associated with Option 1. Notwithstanding this, it is considered that the number of jobs created and potential for increased investment in local supply chains would still be significant subject to the type of posts created, the characteristics of the local labour market and the recruitment/procurement policies of the contractors employed to undertake the work as well as the requirements imposed by the MOD. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from construction activities on brownfield land (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). These effects may be significant in areas where there are existing quality of life issues (such as urban locations where it is assumed a brownfield site would be located either within or adjacent to) and may include, for example, AQMAs. It is assumed that the brownfield site taken forward for development would be located within or adjacent to an existing settlement and that development would be in keeping with its surrounds such that it is not envisaged that development would have a significant effect on the attractiveness of the surrounding area as a result of adverse impacts on landscape/townscape. However, this is to an extent dependent on the technical option implemented. **Technology Options:** The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows: • RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas). • RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above. • Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure. Storage of RCs will require construction of a relatively large facility. This reflects both the footprint of the facility and also the requirement for construction of supporting infrastructure. Consequently, the potential economic benefits associated with this option may be enhanced assuming that capital spend and the number of employment opportunities generated would also be greater. The increased scale and duration of construction activities under the RC option may increase the potential for, and magnitude of, negative effects on quality of life (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic) and the attractiveness of the surrounding areas to existing and prospective residents and businesses (due to the impact of construction activities on visual amenity, noise, vibration and dust). Moreover, the linear form of the vault area necessary to accommodate the storage requirements of RCs and use of heavy lift craneage (which would also be required for RPV storage) could impact on the character of the surrounding area in the medium term. Additional HGV movements associated with this technical option may also cause disruption to local transport networks (and users). However, under this technical option (and for RPV), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects). **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.	
Summary: Option 2 is expected to generate a potentially significant number of employment opportunities which could benefit the local community. However, the extent to which these posts *do* directly benefit the local community will depend on the specific employment opportunities, the local labour market and the employment practices of the lead contractor. The capital investment in the facility could also have local (and potentially regional) economic benefits through use of the local supply chain. There will also be indirect economic benefits from the spend associated with the contractors employed to construct the facility. There may also be potential to ensure the construction of the facility offers training opportunities (e.g. apprenticeship schemes). The level of economic benefit generated under this option may vary depending upon the type of storage facility constructed.	**++/--**

Stage II : Design and Develop the Interim ILW Storage Facilities **Population**	
Although this is currently uncertain, it is expected that storage of RCs, which will require construction of a relatively large facility compared to RPV and Packaged Waste options, will potentially generate the greatest economic benefits. Over the long term, it is expected that construction of an interim ILW storage facility as part of the wider SDP process will generate financial savings by reducing costs associated with current afloat storage. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). Although it is deemed to be uncertain until the location of the facilities has been identified, construction disturbance is likely to be more acute relative to the greenfield option if the brownfield land is already in a built-up area. The severity of these effects is also dependent on the technical option taken forward and in this respect, the increased scale and duration of construction activities under the RC option may increase the potential for, and magnitude of, negative effects on quality of life (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). There is the potential that the construction of an interim ILW storage facility and associated infrastructure may have a negative effect on the attractiveness of the surrounding areas to existing and prospective residents and businesses. This potential may be increased under the RC option given the increased scale of construction activity in the short term and the scale/form of development once complete.	

Option 3: Develop an Existing Licensed/Authorised Site for ILW Storage

Assessment of Effects:

Option 3 utilises existing sites Licensed or Authorised by the UK nuclear regulators. Consequently, it is expected that such sites would provide existing infrastructure (including roads and rail spurs) capable of accommodating a storage facility such that the scale of construction will be relatively small and the magnitude of effects likely to be similar (or less) to those identified in relation to Option 2 above.

As the scale of construction activity would be relatively reduced (when compared to Option 1), the number of employment opportunities and wider economic benefits generated by development of an interim ILW storage facility on the site would be expected to be small. However, as the site would already be Licensed, it is more likely that there would be a local pool of appropriately skilled individuals and suppliers to support the specialist aspects of construction increasing the potential for economic benefits associated with construction to be realised locally. Nonetheless, the extent to which local benefits would be realised depends on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices and recruitment policies employed by the lead contractor. Over the long term, it is expected that construction of an interim ILW storage facility as part of the wider SDP process will generate financial savings by reducing costs associated with current afloat storage.

There will also be indirect economic benefits from the spend associated with the contractors employed to construct the facility. There may also be potential to ensure the construction of the facility offers training opportunities (e.g. apprenticeship schemes).

Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from construction activities on the Licensed site (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). These effects are unlikely to be significant given the scale of construction activities (although this is to an extent dependent on the technical option taken forward); however, their severity may be increased in areas where there are existing quality of life issues. These areas are more likely to be urban locations and may include, for example, Air Quality Management Areas (AQMAs).

As the facility would be located within an existing Licensed/Authorised site, it has been assumed that development would be consistent with the character of the local area such that any effects relating to perception would not be significant although this may be dependent on the technical option taken forward.

Technical Options:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).

<table>
<tr><th colspan="2">Stage II : Design and Develop the Interim ILW Storage Facilities

Population</th></tr>
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- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar.

Proposed Mitigation / Enhancements Measures:

- Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.

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Summary:

Development of an interim ILW storage facility under Option 3 will take place on an existing Licensed/Authorised site where infrastructure capable of accommodating the facility will already be present. The level of disruption to the local community from construction activities is therefore assumed to be less than for Options 1 and 2.

Construction of the interim storage facility will create specific employment opportunities. As the site would already be Licensed and could include activities similar to that proposed for the storage facility, it is considered that there may be a strong prospect for utilising local pools of appropriately skilled labour and suppliers. However, the extent to which this generates local benefits will depend on the exact nature of the local labour market, the employment practices of the lead contractor and the presence of appropriate suppliers.

The level of economic benefit generated under this option may also vary depending upon the type of storage facility constructed. Although this is currently uncertain, it is expected that storage of RCs, which will require construction of a relatively large facility compared to RPV and Packaged Waste options, will potentially generate the greatest economic benefits.

Over the long term, it is expected that construction of an interim ILW storage facility as part of the wider SDP process will generate financial savings by reducing costs associated with current afloat storage.

There is potential for Option 3 to have a short term negative effect on the attractiveness of the surrounding area due to the impact of construction activities although as these effects are expected to be only temporary and minor. As the facility would be located within an existing Licensed/Authorised site, it has been assumed that there would be greater potential for development to be consistent with the character of the local area such that any effects relating to perception are unlikely to be significant.

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Stage III: Dock Submarines and Remove the Radioactive Materials

Population

Option 1: Reactor Compartment Separation

Assessment of Effects:

RC separation will generate a limited number of HGV movements associated with the transportation of equipment, materials and waste to/from site as well as staff movements. Should the capacity and quality of the transport network be insufficient to accommodate these movements, there may be a potential negative effect on local road networks (and users) including, for example, congestion and driver delay. This is dependent upon the routing of traffic, the volume of existing traffic and the capacity of the transport infrastructure. However, it is assumed that as part of the development of the initial dismantling facility, any necessary improvements to existing transport infrastructure will be undertaken (informed by a Transport Assessment and in consultation with the local highways authority) and routing considered to accommodate additional traffic movements which would mitigate this effect. It is not expected that the job opportunities related to operational activities would be of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing.

This option will generate between 20 -30 employment opportunities per year (which is expected to take place over approximately 27 years). The majority of jobs created will require skill sets similar to those associated with ship recycling as the option does not involve intrusion into the RC/RPV. Consequently, only a small proportion of opportunities created will be highly skilled as the requirement for specialist nuclear expertise will be limited. The potential for these posts to directly benefit the local community would depend on the balance between skilled and unskilled posts required and the availability of individuals in the local labour market with those skills and relevant experience. In this respect, should operational activities take place at an initial dismantling facility constructed within an existing Licensed/Authorised site, the potential for these opportunities to be realised locally may be increased (as similar activities may have been undertaken in the area and, consequently, there would be a pre-existing local pool of appropriately skilled individuals). Nonetheless, the extent to which local benefits would be realised depends the recruitment policies of the MOD and of contractors and unless clear contract direction was given to ensure that members of the local community were given preference, the employment opportunities created through the operational phase may not benefit the local community to any substantial extent.

Whilst the number of employment opportunities generated during initial dismantling is lower than those under Options 2 and 3, between 55-100 opportunities will be created in the longer term when the RC is dismantled and the ILW is packaged (Stage 6). However, there is a risk that Suitably Qualified and Experienced Persons (SQEP) will not be available to undertake this work given a potential gap between nuclear related jobs and skills in the future and the loss of current operator knowledge and experience of nuclear submarine reactors. This is considered as part of the assessment of this option under Stage 6.

There may be potential to ensure that operational activity offers training opportunities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from NAS.

Any spend associated with operational activities may lead to an increase in investment in local supply chains, fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. However, given the scale of employment associated this option, such benefits would be limited although further economic benefit may be realised in the longer term during subsequent RC dismantling (this is assessed under Stage 6). The extent to which the RC activities could benefit the local population will depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. There may also be minor local economic benefits associated with employee spend (in terms of consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated under this option.

Whilst operational activities associated with this option will incur costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net economic benefit in relation to national public expenditure.

There may be a negative effect on quality of life from operational activities (e.g. the use of cutting equipment) and associated traffic movements including noise, vibration and emissions predominantly affecting areas around the dismantling facility and alongside local transport networks. However, given the scale of operational activities associated with this option, these effects are not considered to be significant.

Operational activities may have a negative effect on the attractiveness of surrounding areas to existing and prospective residents and businesses. These effects are primarily associated with impacts on visual amenity, noise, vibration and dust caused by, for example, the operation of equipment such as cranes and HGV movements and may undermine the attractiveness of the surrounding area to the existing local community and inward investors. This could result in a reduction in land values and property prices however these effects will be predominantly restricted to the areas around the dismantling facility and in view of the scale of operational activity proposed under this option, are not expected

Stage III: Dock Submarines and Remove the Radioactive Materials Population	
to be significant. Negative effects are also likely to be reduced further through the adoption of BAT and Environmental Permitting requirements although it is recognised that the severity of these effects may be increased should the initial dismantling facility be sensitively located. There may be further adverse effects on this aspect of the objective associated with the second phase of operational activities when their severity may increase given the requirement to transport LLW and the more intensive nature of the works although this is considered as part of the assessment of this option under Stage 6. The radioactive waste element of the site's operation may also affect the attractiveness of surrounding areas to residents and inward investment which may result in changes to land value and property prices. However, this is dependent on how operational activities are perceived. **Proposed Mitigation / Enhancements Measures:** • Any opportunities to employ local contractors and individuals for works or for the use of local materials and suppliers should be identified, although due consideration and adherence to local employment legislation is required (e.g. no discrimination on any grounds). Any potential to offer training opportunities (e.g. apprenticeship schemes) should be pursued. • Any increase in demand for services arising from operational activity and its potential effect on the existing community should be considered carefully. • Explore opportunities for linking with local educational establishments to develop the skill sets required for subsequent RC processing.	
Summary: This option is expected to generate approximately 20-30 employment opportunities per annum during the initial dismantling stage, a small proportion of which will require specialist nuclear expertise. The extent to which these posts *do* benefit the local community will depend on the recruitment policies of the MOD and of any contractors and the local labour market vis-à-vis the nature of the posts created. Operational activities could generate additional economic benefits through investment in local supply chains although in view of the scale of works proposed under this option, it is expected that any such benefits would be very limited during initial dismantling and depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. There may also be minor local economic benefits associated with employee spend (in terms of consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated under this option. Over the long term, it is expected that dismantling, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to national public economic spend. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from dismantling activities. However, given the scale of operational activities associated with this option, these effects are unlikely to be significant although their severity may be increased in areas where there are existing quality of life issues. Operational activities may have a negative effect on the attractiveness of surrounding areas to existing and prospective residents and businesses primarily due to concerns with respect to the radioactive waste element of the site's operation. However, this is dependent on how operational activities are perceived.	**+/?**
Option 2: Reactor Pressure Vessel Removal	
Assessment of Effects: The type and range of effects on population as a result of RPV removal are expected to be similar to those associated with Option 1. However, under Option 2 there would be a need to transport any LLW arising to the LLWR during the initial dismantling phase. It is assumed that LLW would be transported by road and as such there will be an increase in HGV movements (when compared to Option 1). Should the capacity and quality of the existing transport network be insufficient to accommodate these movements, there could be negative effects on local road networks (and users). This option will generate between 30-60 employment opportunities per annum during RPV removal (which is expected to take place over approximately 27 years). Whilst the number of opportunities created is greater than identified for Option 1, it is expected that the additional	

Stage III: Dock Submarines and Remove the Radioactive Materials Population	
posts would require specialist nuclear expertise and in this respect there would be potential to make use of existing skill sets during extraction. As with Option 1 however, the potential for these posts to directly benefit the local community would depend on the characteristics of the local labour market and the recruitment policies of the MOD and contractors. It is considered that further opportunities will be created in the longer term when size reduction and packaging takes place (25-40 FTEs). Whilst more highly skilled opportunities will generated during this period, there is a risk that SQEP will not be available to undertake this work given a potential gap between nuclear related jobs and skills in the future and the loss of current operator knowledge and experience of nuclear submarine reactors. This is considered as part of the assessment of this option under Stage 6. The additional HGV movements associated with this option could also increase potential quality of life effects associated with noise, vibration, dust and emissions during initial dismantling relative to Option 1. However, it is assumed that the number of LLW movements per annum would be minor and their implications in terms of the capacity of the existing transport network would be considered during the design and construction of the initial dismantling facility (informed by a Transport Assessment and in consultation with the local highways authority) which would mitigate these effects. There may also be an opportunity to transport LLW by rail or, given the coastal location, sea which could reduce these effects further. Under this option the extent of operational activities would be intensified such that the level and duration of noise, vibration and emissions caused by the operation of equipment may also increase relative to Option 1. However, the extent of external submarine hull cutting required under this option would be less and consequently it is considered more likely that noise, vibration and emissions associated with the use of cutting equipment would be reduced. There is potential for RPV removal to have adverse effects on the attractiveness of surrounding areas beyond those identified under Option 1 primarily as a result of additional HGV movements required to transport waste (including LLW) and equipment to and from the initial dismantling site. However, in view of the low volume of HGV movements related to operational activities, it is anticipated that these effects would be minor although it is recognised that there is potential for the severity of these effects to be increased should the dismantling facility be sensitively located. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 is expected to generate approximately 30-60 employment opportunities per annum which will include some specialist posts. The extent to which these posts *do* benefit the local community will depend on the recruitment policies of the MOD and of any contractors and the local labour market vis-à-vis the nature of the posts created. Operational activities may generate additional economic benefits through investment in local supply chains although in view of the scale of works proposed under this option, it is expected that any such benefits would be limited during initial dismantling and depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. There may also be minor local economic benefits associated with employee spend (in terms of consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated under this option. Over the long term, it is expected that dismantling activities, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to national public economic spend. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from dismantling activities. However, given the scale of operational activities associated with this option, these effects are unlikely to be significant although their severity may be increased in areas where there are existing quality of life issues. Operational activities may have a negative effect on the attractiveness of the surrounding areas to existing and prospective residents and businesses primarily due to concerns with respect to the radioactive waste element of the site's operation. However, this is dependent on how operational activities are perceived.	**+/?**
Option 3: Reactor Pressure Vessel Removal and Size Reduction for Storage as Packaged Waste	

Stage III: Dock Submarines and Remove the Radioactive Materials Population	
Assessment of Effects: Operational effects related to the implementation of Option 3 on population are expected to be similar to those associated with Options 1 and 2; however, as RPV removal, size reduction and ILW packaging would be undertaken under this option, the magnitude of these effects may differ. In this respect, this option is expected to generate a greater number of HGV movements in the medium term relative to Options 1 and 2 to transport waste (including LLW), materials and equipment to/from site which could increase the potential adverse effects on local road networks (and users) and quality of life issues (e.g. noise, vibration and emission). However, it is assumed that the number of LLW movements per annum would be minor and their implications on the capacity of existing transport network would be considered during the design and construction of the dismantling facility (informed by a Transport Assessment and in consultation with the local highways authority) which would mitigate these effects. There may also be an opportunity to transport LLW by rail or, given the coastal location, sea which could further reduce these effects. As size reduction activities would be undertaken within the dismantling facility, it has been assumed that any associated emissions, noise and vibration associated with this element of the works would be contained within the site such that there would not be any additional adverse effects on quality of life beyond those identified under Options 1 and 2. This option will generate between 55 and 100 FTEs per annum over the period of operational activities (approximately 27 years). A number of these posts are expected to require specialist nuclear skills and expertise and in this respect the option will enable full advantage to be taken of existing SQEP, particularly those with practical knowledge gained from operating and conducting engineering work on the submarines to be decommissioned. As with Options 1 and 2 however, the potential for these posts to directly benefit the local community would depend on the characteristics of the local labour market and the recruitment policies of the MOD and contractors. It is anticipated that this option will generate investment in local supply chains, fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. In undertaking all activities simultaneously it is anticipated that the option would maximise any benefits associated with economies of scale. That being said, the extent to which these benefits would be locally significant would continue to depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: There is potential for Option 3 to generate medium term positive effects in relation to the economic aspects of this objective. As the activities will lead to the generation of packaged waste, it is likely that these effects will be at a higher level than either Option 1 or 2; however, as the scale of employment opportunities are estimated to be between 55-100 FTEs per annum, it is not considered significant (even for a local economy). As full processing will be undertaken within a single phase, the option may enable full advantage to be taken of existing SQEP, particularly those with practical knowledge gained from operating and conducting engineering work on the submarines to be decommissioned. Operational activities may generate additional economic benefits through investment in local supply chains although in view of the scale of works proposed under this option, it is expected that any such benefits would be limited during initial dismantling and depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. There may also be minor local economic benefits associated with employee spend (in terms of consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated under this option. Over the long term, it is expected that dismantling activities, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to national public economic spend. In undertaking all activities simultaneously, it is anticipated that this option would maximise any benefits associated with economies of scale. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from dismantling activities. However, given the scale of operational activities associated with this option, these effects are unlikely to	**+/?**

Stage III: Dock Submarines and Remove the Radioactive Materials Population	
be significant although their severity may be increased in areas where there are existing quality of life issues. Operational activities may have a negative effect on the attractiveness of the surrounding areas to existing and prospective residents and businesses primarily due to concerns with respect to the radioactive waste element of the site's operation. However, this is dependent on how operational activities are perceived.	

Stage IV: Dismantle the Residual Submarine Hulls, and Process Wastes Population	
All Options	
Assessment of Effects: Preparation activities will require transportation of furnishings, cosmetic panelling, tiles, internal systems, insulating materials and wastes from the initial dismantling facility as well as the movement of staff to undertake the works. Should the capacity and quality of the transport network be insufficient to accommodate these movements (either alone or in combination with other activities at the site), there may be a potential negative effect on local road networks (and users) including, for example, congestion and driver delay. This is dependent upon the routing of traffic, the volume of existing traffic and the capacity of the transport infrastructure. However, it is assumed that as part of the development of the initial dismantling facility, any necessary improvements to existing transport infrastructure will be undertaken (informed by a Transport Assessment and in consultation with the local highways authority) and routing considered to accommodate additional traffic movements which would mitigate this effect. There may also be an opportunity to transport wastes and materials by sea, further minimising disruption to users. Subsequent recycling of submarines will generate HGV movements associated with the transportation of materials and equipment for reuse, recyclates and wastes for disposal that may affect road networks (and users) in the vicinity of the ship recycling facility. As similar activities would already take place at the facility, it is assumed that the capacity and quality of the transport network would be sufficient to accommodate these movements and it is not expected that the works would generate any significant additional movements of staff, materials or equipment beyond those associated with the normal operations. It is not expected that the job opportunities related to works at either the initial dismantling facility or ship recycling facility would be of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing. Preparation activities may increase investment in local supply chains, fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. However, in view of the scale of works it is expected that any such benefits would be minor. Works of the scale and duration associated with subsequent recycling of submarines are expected to significantly benefit the firm selected to undertake the work and could generate some additional employment opportunities which may benefit the local population (given that similar activities already take place in the locality). These works may also generate further economic benefits in the locality of the facility for example, those associated with the procurement of materials and services by the contractors. The extent to which these benefits would be locally significant will depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. Whilst dismantling will incur costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net economic benefit in relation to national public expenditure. There may be a negative effect on quality of life from preparation activities (e.g. the use of hydraulic powered equipment during soft strip) including noise, vibration and emissions. However, the nature and scale of the works is such that it is anticipated that these effects will be contained within the initial dismantling facility. There is also potential for HGV movements associated with preparation activities to generate noise, vibration and emissions that could have significant effects alongside transport networks in areas where quality of life issues do exist. However, the effects on this aspect of the objective are deemed to be uncertain until the location of a dismantling facility has been identified. Recycling activities will generate noise, vibration and emissions associated with the use of equipment (e.g. hot cutting tools) and HGV movements required to transport waste and recyclates from the ship recycling facility may impact upon the quality of life of residents and undermine the attractiveness of surrounding areas. However, as the works would be of a similar nature to those already undertaken on site, it is assumed that there would be no significant change to the existing baseline. **Proposed Mitigation / Enhancements Measures:** • Any opportunities to employ local contractors and individuals for works or for the use of local suppliers should be identified, although due consideration and adherence to local employment legislation is required (e.g. no discrimination on any grounds). Any potential to offer training opportunities (e.g. apprenticeship schemes) should be pursued.	
Summary: The majority of the works associated with this stage of the SDP process will be undertaken at an existing commercial ship	

Stage IV: Dismantle the Residual Submarine Hulls, and Process Wastes Population	
recycling facility and, consequently, only a limited number of new employment opportunities will be generated. The extent to which these posts *do* benefit a local community will depend on the recruitment policies of any contractors and the extent to which the local labour market can meet skill requirements. There may be potential to ensure that dismantling activities offer training opportunities (e.g. apprenticeship schemes) for benefit of the local community. Preparation and ship recycling activities may generate additional economic benefits through investment in local supply chains in the vicinity of both the initial dismantling facility and the ship recycling facility although in view of the nature of the works, it is expected that any such benefits would be limited and would depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. There may also be minor local economic benefits associated with employee spend although this is unlikely to be significant given the number of employment opportunities likely to be generated. Over the long term, it is expected that preparation and recycling activities, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to national public economic spend. There may be a negative effect on quality of life primarily associated with HGV movements (e.g. noise, vibration and emissions) alongside local transport networks in the vicinity of the initial dismantling facility. These effects may be significant in areas where quality of life issues do exist. However, the effects on this aspect of the objective are deemed to be uncertain until the location of a dismantling facility is identified.	**+/?**

Stage V: Transport the RC/RPV/ILW to Interim Storage

Population

Option 1: Reactor Compartment Transport to Interim Storage

Assessment of Effects:

This option will generate some vehicle movements associated with the transportation of workers employed to undertake maintenance activities at the storage facility and security personnel as well as a limited number of HGV movements which could have a negative impact on the local transport network (and users). However, it is anticipated that the number of staff associated with these activities will be minimal and, consequently, the volume of vehicle movements would be low although movements to/from the site will increase during RC unloading and any additional preparatory works prior to storage. It is also assumed that as part of the development of the interim ILW storage facility, any necessary improvements to existing transport infrastructure will be undertaken (informed by a Transport Assessment and in consultation with the local highways authority) to accommodate additional capacity requirements.

It is not expected that the job opportunities related to the transportation and storage of RCs would be of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing.

It is assumed that operational activities associated with the transportation of RCs (including preparation for transport and loading and unloading) would be undertaken predominantly by contractors utilising existing employees and any job opportunities that are created during this phase of the SDP process are expected to be temporary (as only a single RC would be transported per year). Once in storage, RCs will require regular inspection and maintenance to ensure that their structural integrity is preserved which may generate some additional employment opportunities and a small number of security personnel jobs would also be created. However, the potential for these posts to directly benefit the local community would depend on the extent to which the activities are undertaken by existing employees, the availability of individuals in the local labour market with relevant skills and experience as well as the recruitment policies of the MOD and of contractors. Unless clear contract direction was given to ensure that members of the local community were given preference, the employment opportunities created may not benefit the local community to any substantial extent.

There may be potential to ensure that operational activity offers training opportunities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from NAS.

RC transportation and storage is unlikely to increase demand from local supply chains. The movement of the RC will require a barge and tow/heavy lift vessel, which it is assumed will be provided by a specialist contractor. Given the frequency of movement (one per annum) and that the contractor may be from any UK port, the likelihood that it would benefit a company local to the initial dismantling facility, would appear remote. Storage of the RC, depending on the length of time, may create local supplier opportunities associated with maintenance of the facility; however, these are uncertain.

There may also be some very minor local economic benefits associated with storage employee spend (in terms of consumables and entertainment).

Whilst RC transportation and storage will incur costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net economic benefit in relation to national public expenditure.

Under this option, noise, vibration and emissions to air may be generated which could have a negative effect on the quality of life of local communities in the vicinity of both the initial dismantling facility and interim ILW storage facility. Sources are likely to include the use of heavy lifting equipment and welding during preparation, loading and unloading of RCs and maintenance activities (i.e. should works be required to reinforce RC shielding). However, it is expected that any effects would be infrequent and temporary and noise, vibration and emissions are likely to be contained within the facilities. HGV movements required for the transportation of any additional equipment, materials or waste to/from the interim storage facility may also generate noise, vibration and emissions which could have negative effects alongside transport networks in areas where there are existing quality of life issues. The frequency and number of such movements however is expected to be very small and not discernible against a backdrop of existing traffic such that any effects on quality of life are unlikely to be significant.

RC storage may have a negative effect on the attractiveness of surrounding areas to existing and prospective residents and businesses primarily due to concerns with respect to the radioactive waste element of the site's operation which may result in changes to land values and property prices. However, this is dependent on how operational activities are perceived.

Proposed Mitigation / Enhancements Measures:

- Any opportunities to employ local contractors and individuals for works or for the use of local materials and suppliers should be identified,

Stage V: Transport the RC/RPV/ILW to Interim Storage **Population**	
although due consideration and adherence to local employment legislation is required (e.g. no discrimination on any grounds). Any potential to offer training opportunities (e.g. apprenticeship schemes) should be pursued. • Adopt HGV routing which seeks to avoid residential areas and existing AQMAs.	
Summary: RC transportation and storage is expected to generate only a small number of employment opportunities primarily associated with maintenance activities and security. The extent to which these posts *do* benefit the local community will depend on recruitment policies of the MOD and of any contractors and the extent to which the local labour market can meet skill requirements. There may be potential to ensure that maintenance activities offer training opportunities (e.g. apprenticeship schemes) for benefit of the local community. The transportation of RCs may provide some economic benefit (as the contractual costs of the move could be substantial); however, given the need for a specialist contractor, it is uncertain whether there would be any benefit for a local supplier. There may also be minor local economic benefits associated with employee spend however this is unlikely to be significant given the number of employment opportunities generated under this option. Over the long term, it is expected that RC transportation and storage, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to national public economic spend. The loading and unloading of RCs and maintenance activities will generate some noise, vibration and emissions to air although it is expected that these effects would be infrequent, temporary and contained within the dismantling and storage facilities such that they are unlikely to have a significant impact on the quality of life of residents in surrounding areas. It is assumed that the number of HGV movements associated with transportation and storage would be minor such that any effects on quality of life are unlikely to be significant. RC storage could affect the attractiveness of surrounding areas to existing and prospective residents and businesses primarily due to the radioactive waste element of the site's operation. However, this is dependent on how the storage of RCs is perceived.	**+/?**
Option 2: Reactor Pressure Vessel Transport to Interim Storage	
Assessment of Effects: The type and range of effects on population as a result of RPV transportation and storage are expected to be similar to those identified under Option 1. The RPV could be transported from the initial dismantling facility to the interim ILW storage facility either by sea, rail or road. Movement by sea could create similar commercial and economic opportunities as for Option 1; however, the size of any vessel used would be commensurately smaller than for RC. If transportation by rail is chosen, it is assumed that the RPV (and its container pack) would be taken to a rail freight handling site and loaded directly onto a rail bogey. The initial movement from the dismantling facility to the rail freight handling facility would be via a heavy lift HGV. The RPV would then be transported to the interim storage facility. At this stage, it is unknown whether the interim storage facility would have a rail head. Given that the frequency of movement of the RPV would be one per annum, it is not considered that there would be any adverse effects on adjacent populations. Should the RPV be transported by road, the use of a wide/abnormal load vehicle and security escort would be required which could cause disruption to users of local road networks (subject to timing and routing). However, any effects would be temporary, occur once a year and geographically restricted (as RPVs are unlikely to be moved over significant distances due to their size and weight). Movement of RPVs by road could result in a temporary increase in noise, vibration and emissions to air which could have a negative effect on the quality of life of residents along the transport corridor. However, they would be temporary and given the anticipated frequency of any RPV movement, it is assumed that any effects are unlikely to be significant as only one RPV would be transported per annum.	

Stage V: Transport the RC/RPV/ILW to Interim Storage

Population

Storage of the RPV, depending on the length of time, may create local supplier opportunities associated with maintenance of the facility; however, these are uncertain. However, as it is assumed that storage of RPVs will be within the container designed for transportation which will continue to satisfy the requirement for containment and shielding and should ensure that the RPV retains structural integrity such that any maintenance activities would be limited.

Proposed Mitigation / Enhancements Measures:

- Measures proposed will include those as outlined for Option 1.
- Ensure that RPV movement by road avoids peak hours.

Summary: RPVs may be transported by road, rail or sea. Transportation by road could cause short term disruption to users of local road networks due to the requirement for use of a wide/abnormal load vehicle and security escort. Similar effects may occur as a result of the initial movement of the RPV from the initial dismantling facility to a rail freight handling facility should RPVs be transported by rail. However, as only one RPV would be moved per annum, any adverse effects would be temporary and infrequent and are therefore not considered to be significant. RPV transportation (whether by road, rail or sea) and storage is expected to generate only a small number of employment opportunities primarily associated with maintenance activities and security. This option may generate commercial opportunities and additional economic benefits associated with the transport and storage of the RPV (including manufacture of an over-pack). However, in view of the scale of activity associated with this stage it is expected that any such benefits would be minor. There may also be minor local economic benefits associated with employee spend (in terms of consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated under this option. Over the long term, it is expected that RPV transportation and storage, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to national public economic spend. The loading, transport and unloading of RPVs and any maintenance activities will generate some noise, vibration and emissions to air although it is expected that these effects would be infrequent, temporary and contained within the dismantling and storage facilities such that they are unlikely to have a significant impact on the quality of life of residents in surrounding areas. RPV storage could affect the attractiveness of surrounding areas to existing and prospective residents and businesses primarily due to the radioactive waste element of the site's operation. However, this is dependent on the storage of RPVs is perceived.	**+/?**

Option 3: Packaged Waste Transport to Interim Storage

Assessment of Effects:

Effects related to the implementation of Option 3 on population are expected to be similar to those associated with Options 1 and 2.

Packaged waste could be transported from the initial dismantling facility to the interim storage facility by either rail or road. If the packaged waste were transported by road, it would require a heavy load vehicle as the weight of the packaged waste (including an over-pack) is anticipated to exceed standard articulated HGV limits. Any such movement could require a security escort may cause localised and temporary disruption to users of local road networks (subject to timing and routing). Transportation by rail would require movement of packaged waste to a rail freight facility via a heavy load vehicle for onwards transport to the interim storage facility. At this stage, it is unknown whether the interim storage facility would have a rail head. This may generate similar effects to transportation of packaged waste by road albeit for a shorter duration (as the rail freight facility would be initiatively in relative close proximity to the dismantling facility).

As a high end estimate, it is assumed that each container of packaged is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated disruption on adjacent sensitive receptors, this frequency would not be considered to pose any effect to the local population, under normal operating circumstances.

Stage V: Transport the RC/RPV/ILW to Interim Storage **Population**	
The potential investment in local supply chains associated with transportation may be reduced as it is expected that costs related to packaged waste transportation would be significantly less than for Option 1 and Option 2. That being said, transportation of packaged waste will involve the manufacture of over-packs and a greater number of movements per annum than for Options 1 and 2. In addition, it is considered that there would be an increased likelihood that a local specialist heavy goods transportation company would be contracted to move packaged waste such that the potential benefit to local supply chains may be greater. **Proposed Mitigation / Enhancements Measures:** • Measures proposed will include those as outlined for Option 1. • Ensure that packaged waste movement by road avoids peak hours.	
Summary: Packaged waste could be transported either by road or rail. Transportation by road could cause short term disruption to users of local road networks due to the requirement for use of a wide/abnormal load vehicle and security escort. However, as there will be a maximum of 8 PW movements per annum, any adverse effects would be temporary and infrequent and are therefore not considered to be significant. Transportation by rail would require movement of packaged waste to a rail freight facility via a heavy load vehicle for onwards transport to the interim storage facility. This may therefore result in similar disruption to that associated with transportation of packaged waste by road although the magnitude of effects would be less as the distance travelled by heavy load vehicle would be intuitively less. Packaged waste transportation and storage is expected to generate only a small number of employment opportunities primarily associated with maintenance activities and security. This option may generate commercial opportunities and additional economic benefits associated with the transport and storage of the packaged waste (including the manufacture of over-packs). However, in view of the scale of activity associated with this stage it is expected that any such benefits would be minor. There may also be minor local economic benefits associated with employee spend (in terms of consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated under this option. Over the long term, it is expected that packaged waste transportation and storage, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to national public economic spend. The loading, transport and unloading of packaged waste and any maintenance activities will generate some noise, vibration and emissions to air although it is expected that these effects would be infrequent, temporary and contained within the dismantling and storage facilities such that they are unlikely to have a significant impact on the quality of life of residents in surrounding areas. Packaged waste storage could affect the attractiveness of surrounding areas to existing and prospective residents and businesses primarily due to the radioactive waste element of the site's operation. However, this is dependent on the storage of PW is perceived.	**+/?**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Population
Option 1: Size Reduce the Reactor Compartment and Transfer Packaged Waste to the Proposed GDF

Assessment of Effects:

Depending on the location of the interim ILW storage facility and the size reduction facility there may be a requirement to transport RCs prior to processing. It is expected that, due to the size and weight of RCs, this will only occur by sea and by barge or heavy lift vessel. RC transportation is unlikely to increase demand from local supply chains and it is assumed that this will be undertaken by a specialist contractor. Given the frequency of movement (one per annum) and that the contractor may be from any UK port, the likelihood that it would benefit a company local to the RC storage facility, would appear remote.

Dismantling the RC to packaged waste will generate a limited number of HGV movements associated with the transportation of equipment, materials and waste (including LLW) to/from the facility as well as staff movements. Should the capacity and quality of the transport network be insufficient to accommodate these movements, there may be a potential negative effect on local road networks (and users) including, for example, congestion and driver delay. This is dependent upon the routing of traffic, the volume of existing traffic and the capacity of the transport infrastructure. However, it is assumed that as part of the development of the size reduction facility, any necessary improvements to existing transport infrastructure will be undertaken (informed by a Transport Assessment and in consultation with the local highways authority) and routing considered to accommodate additional traffic movements which would mitigate this effect. There may also be an opportunity to transport equipment, materials and waste by rail or, given the coastal location, sea which could further reduce these effects.

RC dismantling to packaged waste will involve the cutting of a hole in the RC casing and removal of all systems and equipment with connections to the RPV being sealed individually. The RPV will then be removed from the RC using either heavy lifting craneage or jack lifting equipment and subsequently moved inside the size reduction facility. Within the facility, the RPV will be size reduced and ILW packaged using well understood remote handling, cutting, containment and lifting techniques performed by skilled nuclear workers. Once the RPV has been removed the remaining RC casing which is expected to be non radioactive will be cut up and size reduced on site. All items removed or size reduced from the RC casing will be monitored, characterised and transferred to a suitable waste processing facility for recycling or disposal as appropriate. It is expected that there will be likely effects associated with this activity such as noise, vibration and potential emissions to air (dust) from cutting activities and transport movements and are expected to be of a similar nature to other activities undertaken on a ship recycling facility. However, it is uncertain as to where the cut up and size reduction of the RC casing will take place within the SDP site and subsequently the level of shielding that will be provided. The scale of effect of this activity is therefore uncertain at this point.

As already identified the subsequent recycling of the remaining non-radioactive hull will generate HGV movements associated with the transportation of materials and equipment for reuse, recyclates and wastes for disposal which may affect road networks (and users) in the vicinity of the SDP site. As similar activities would already take place at the facility, it is assumed that the capacity and quality of the transport network would be sufficient to accommodate these movements and it is not expected that the works would generate any significant additional movements of staff, materials or equipment beyond those associated with the normal operations.

Packaged waste could be transported from the size reduction facility to the proposed GDF by either rail or road. If packaged waste was transported by road, it would require a heavy load vehicle as the weight of the packaged waste (including an overpack) is anticipated to exceed standard articulated HGV limits. Any such movement could require a security escort and may cause localised and temporary disruption to users of local road networks (subject to timing and routing). Transportation by rail would also require movement of packaged waste to a rail freight facility via a heavy load vehicle for onwards transport to the proposed GDF. As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of any associated disruption to adjacent sensitive receptors, this frequency is unlikely to adversely affect the local population, under normal operating circumstances.

It is not expected that the job opportunities related to operational activities would be of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing.

It is estimated that this option would generate between 55-100 FTEs, a large proportion of which are expected to require specialist nuclear skills and expertise. The potential for these posts to directly benefit the local community would depend on the balance between skilled and unskilled posts required and the availability of individuals in the local labour market with those skills and relevant experience. In this respect, there is a risk that SQEP will not be available to undertake this work given a potential gap between nuclear related jobs and skills in the future and the loss of current operator knowledge and experience of nuclear submarine reactors. Nonetheless, the extent to which local benefits would be realised

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF

Population

depends the recruitment policies of the MOD and of contractors and unless clear contract direction was given to ensure that members of the local community were given preference, the employment opportunities created through the operational phase may not benefit the local community to any substantial extent.

There may be potential to ensure that operational activity offers training opportunities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from NAS.

Any spend associated with operational activities may lead to an increase in investment in local supply chains, fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. However, given the scale of employment associated with this option, such benefits would be limited. Recycling of the remaining non-radioactive hull is expected to significantly benefit the firm selected to undertake the work and could generate some additional employment opportunities which may benefit the local population (given that similar activities already take place in the locality). These works may also generate further economic benefits in the locality of the facility for example, those associated with the procurement of materials and services by the contractors. The extent to which any benefits would be locally significant will depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. There may also be minor local economic benefits associated with employee spend (in terms of consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated under this option.

The potential investment in local supply chains associated with the transportation of packaged waste is expected to be minor. That being said, transportation of packaged waste will involve the manufacture of overpacks and there would be potential to utilise a local specialist heavy goods transportation company.

Whilst operational activities associated with this option will incur costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net economic benefit in relation to national public expenditure.

There may be a negative effect on quality of life from operational activities during RPV removal (e.g. associated with the use of cutting equipment) including noise, vibration and emissions predominantly affecting areas around the size reduction facility. However, subsequent RPV processing and ILW packaging would be undertaken inside the size reduction facility building and consequently it has been assumed that the majority of associated emissions, noise and vibration associated with this element of the works would be contained within the site such that adverse effects on quality of life would be minor. HGV movements associated with this option (including the movement of packaged waste) will also generate some noise, vibration and emissions which could affect quality of life alongside local transport networks. However, as the number of movements per annum would be minor, these effects are not considered to be significant and may be reduced should equipment, materials and waste be transported by sea although it is recognised that there is potential for the severity of these effects to be increased should the size reduction facility be sensitively located.

Operational activities may have a negative effect on the attractiveness of areas surrounding the size reduction facility to existing and prospective residents and businesses. These effects are primarily associated with impacts on visual amenity, noise, vibration and dust caused by, for example, the operation of equipment such as cranes and HGV movements and may undermine the attractiveness of the surrounding area to the existing local community and inward investors. This could result in a reduction in land values and property prices however, these effects will be predominantly restricted to the areas around the size reduction facility and in view of the scale of operational activity proposed under this option, are not expected to be significant. Negative effects are also likely to be reduced further through the adoption of BAT and Environmental Permitting requirements although it is recognised that the severity of these effects may be increased should the size reduction facility be sensitively located.

The radioactive waste element of the site's operation may also affect the attractiveness of surrounding areas to residents and inward investment which may result in changes to land value and property prices. However, this is dependent on how operational activities are perceived.

Recycling activities will generate noise, vibration and emissions associated with the use of equipment (e.g. hot cutting tools) and HGV movements required to transport waste and recyclates which may impact upon the quality of life of residents and undermine the attractiveness of surrounding areas. However, as the works would be of a similar nature to those already undertaken on site, it is assumed that there would be no significant change to the existing baseline.

Proposed Mitigation / Enhancements Measures:

- Any opportunities to employ local contractors and individuals for works or for the use of local materials and suppliers should be identified, although due consideration and adherence to local employment legislation is required (e.g. no discrimination on any grounds). Any potential

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF **Population**	
to offer training opportunities (e.g. apprenticeship schemes) should be pursued. • Any increase in demand for services arising from operational activity and its potential effect on the existing community should be considered carefully. • Explore opportunities for linking with local educational establishments to develop the skill sets required for subsequent RC processing.	
Summary: Option 1 is expected to generate between 55 and 100 employment opportunities per annum for the duration of operational activities, the majority of which will require specialist nuclear expertise. The extent to which these posts *do* benefit the local community will depend on the recruitment policies of the MOD and of any contractors and the local labour market vis-à-vis the nature of the posts created. Under this option there is a risk that SQEP will not be available to undertake the final cut-up given a potential gap between nuclear related jobs and skills in the future and the loss of current operator knowledge and experience of nuclear submarine reactors. Operational activities including the transportation of packaged waste could generate additional economic benefits through investment in local supply chains although in view of the scale of works proposed under this option, it is expected that any such benefits would be limited and will depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. There may also be minor local economic benefits associated with employee spend (in terms of consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated under this option. Over the long term, it is expected that operational activities, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to national public economic spend. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from operational activities and HGV movements. Nonetheless, subsequent processing and packaging would be undertaken inside a size reduction facility building and it is expected that the frequency of HGV movements would be small such that adverse effects on quality of life would be minor. Recycling activities will also generate noise, vibration and emissions associated with the use of equipment and HGV movements. However, as the works would be of a similar nature to those already undertaken on site, it is assumed that there would be no significant change to the existing baseline. Operational activities may have a negative effect on the attractiveness of surrounding areas to existing and prospective residents and businesses primarily due to concerns with respect to the radioactive waste element of the site's operation. However, this is dependent on how operational activities are perceived.	**+/?**
Option 2: Size Reduce the Reactor Pressure Vessel and Transfer Packaged Waste to the Proposed GDF	
Assessment of Effects: The type and range of effects on population under this option are expected to be similar to those associated with Option 1. Under Option 2 the volume of waste arisings (both LLW and non-radioactive) would be reduced (relative to Option 1) as systems and equipment contained within the RC will have already been removed and some size and weight reduction of the RPV would have been undertaken during Stage 3. It is therefore expected that the number of HGV movements associated with this option and, consequently, potential impact on local road networks and (users), would be reduced relative to Option 1. However, should the RPV be transported by road or rail from the interim storage facility to the size reduction facility, the use of a wide/abnormal load vehicle and security escort would be required which could cause disruption to users of local road networks (subject to timing and routing). However, any effects would be temporary, occur once a year and geographically restricted (as RPVs are unlikely to be moved over significant distances due to their size and weight). This option will generate 25-40 FTE jobs per annum, the majority of which will require specialist nuclear expertise. As with Option 1 however, the potential for these posts to directly benefit the local community would depend on the characteristics of the local labour market and the recruitment policies of the MOD and contractors and there is a risk that SQEP will not be available to undertake the work given a potential gap	

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Population	
between nuclear related jobs and skills in the future and the loss of current operator knowledge and experience of nuclear submarine reactors. The potential level of investment in local supply chains would be reduced relative to Option 1 as it is assumed that spend associated with dismantling and packaging activities would be less (as RPV removal and recycling of the RC casing would not be required). That being said, the extent to which these benefits would be locally significant would continue to depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. It is expected that RPV dismantling and packaging would be undertaken inside a size reduction facility building. Consequently, it is expected that any associated emissions, noise and vibration would be contained within the site such that there would not be any significant adverse effects on quality of life or the attractiveness of surrounding areas due to operational activities. As the number of HGV movements would be reduced under this option (relative to Option 1), it is also likely that emissions to air, noise and vibration alongside local transport networks would also be less. However, should RPVs be transported by road (or to a lesser extent rail) from the interim storage facility to the size reduction facility there may be additional emissions, noise and vibration, although it is expected that any effects would only be temporary and infrequent. As recycling of submarine hulls will have been undertaken, there would not be any additional effects on population in the vicinity of the ship recycling facility beyond those associated with Stage 4. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 is expected to generate 25-40 FTE employment opportunities per annum for the duration of operational activities, the majority of which will require specialist nuclear expertise. The extent to which these posts *do* benefit the local community will depend on the recruitment policies of the MOD and of any contractors and the local labour market vis-à-vis the nature of the posts created. Under this option there is a risk that SQEP will not be available to undertake the final cut-up given a potential gap between nuclear related jobs and skills in the future and the loss of current operator knowledge and experience of nuclear submarine reactors. Operational activities including the transportation of packaged waste could generate additional economic benefits through investment in local supply chains although in view of the scale of works proposed under this option, it is expected that any such benefits would be very limited and depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. There may also be minor local economic benefits associated with employee spend (in terms of consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated under this option. Over the long term, it is expected that operational activities, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to national public economic spend. RPV processing and ILW packaging would be undertaken inside a size reduction facility building and, therefore, it is expected that associated emissions, noise and vibration would be contained within the site such that there would not be any significant adverse effects on quality of life or the attractiveness of surrounding areas. There is potential for emissions to air, noise and vibration from HGV movements related to the transportation of employees, equipment, materials and waste (including ILW) and the transportation of RPVs (if by road or rail) to affect quality of life and the attractiveness of areas alongside local transport networks. However, it is assumed that the number and frequency of movements would be small such that any adverse effects are likely to be minor although it is recognised that there is potential for their severity to be increased should the size reduction facility be sensitively located.	**+/?**
Option 3: Transport Packaged Waste to the Proposed GDF	
Assessment of Effects: Under Option 3 all initial dismantling, size reduction and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP	

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Population	
process) and consequently, effects on this objective will relate to the transportation of packaged waste to the proposed GDF only. These effects are expected to be similar to those associated with the transportation of packaged waste identified under Options 1 and 2. There is the potential for packaged waste to be transported at a higher frequency than 8 separate movements per annum (subject to the number of over packs available and proposed GDF availability to receive packaged waste) as under this option no further processing prior to transportation to the proposed GDF would be required). As a high end estimate, if all packaged waste was to be moved over a period of 1 year with the 2 overpacks, transport movements would occur approximately 4 times per week. Movements of this frequency could impact upon local road networks (and users), particularly as the transportation of packaged waste (whether by road or rail) would require a heavy load vehicle and, potentially, a security escort which could cause disruption. There may also be negative effects on local quality of life alongside local transport networks due to associated noise, vibration and emissions to air. However, within the context of a project lasting decades, these effects would only be temporary and are therefore unlikely to be significant although it is recognised that their severity is dependent on a number of factors including whether packaged waste is transported by road or rail, the timing and routing of movements and the proximity of sensitive receptors. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Under Option 3 all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process). Packaged waste transportation may generate some very limited commercial opportunities and economic benefits including expenditure associated with the manufacture of any additional overpacks and there would be potential to utilise a local specialist heavy goods transportation company. Over the long term, it is expected that packaged waste transportation, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to national public economic spend. The loading, transport and unloading of packaged waste will generate some noise, vibration and emissions to air although it is expected that these effects would be infrequent and temporary such that they are unlikely to have a significant impact on the quality of life of residents in surrounding areas.	**0**

Stage VII: Decommission SDP Facilities

Population

Option 1: Decommission Greenfield Sites

Assessment of Effects:

Decommissioning activities are expected to generate similar effects on population to those associated with the development of SDP facilities (Stages 1 and 2 of this assessment). It is expected that the duration of works would be longer given the more complex nature of decommissioning activities and therefore there is potential for the magnitude of these effects to be increased.

Decommissioning would generate significant employment opportunities for the duration of the works although the number of opportunities created is currently uncertain. It is anticipated that additional specialist opportunities relating to the disposal of radiologically contaminated wastes would be also created. Under this option, all structures and infrastructure (including roads, docking facilities and hardstanding) would have to be removed increasing the duration and scale of works and, therefore, the number of employment opportunities created. Notwithstanding this, the potential for these posts to directly benefit the local community would depend on the balance between skilled and unskilled posts required and the availability of individuals in the local labour market with those skills and relevant experience. It would also depend on the recruitment policies of the contractors employed to undertake the work and unless clear contract direction was given to ensure that members of the local community were given preference, the temporary employment opportunities created through the decommissioning phase may not benefit the local community to any substantial extent.

It is not expected that the decommissioning of SDP facilities would generate employment opportunities of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing. Whilst it is assumed that activities would also not necessitate the construction or enhancement of transport infrastructure, decommissioning traffic may cause disruption to local road networks (and users) in the vicinity of SDP facilities. However, these effects would only be temporary (i.e. for the duration of decommissioning activities) and, subject to the technical option taken forward, there may also be potential to transport associated materials, wastes and equipment by sea which would minimise disruption to users of existing transport networks. Nonetheless, for those individuals or communities that experience disruption, it is recognised that this may not be the perception.

It is assumed that a significant proportion of SDP expenditure will be related to the decommissioning of SDP facilities. Decommissioning works and associated expenditure may increase investment in local supply chains fostering growth, generating indirect employment opportunities and enhancing the robustness of the local economy. The extent to which these effects would be locally significant would depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. However, such effects would only be temporary (for the duration of decommissioning activities). There may also be local economic benefits associated with demolition worker spend (in terms of temporary accommodation, consumables and entertainment). However, the extent of this will be dependent on the approach to contractor recruitment and the proportion of workers who will need temporary accommodation.

Whilst the decommissioning of facilities will incur costs, the SDP process is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net benefit in relation to national public expenditure. Some costs may also be offset by the subsequent sale of restored sites and any net profit generated (i.e. that created by increased land values since site purchase) although this is dependent on their market value at the time of sale.

Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from decommissioning activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from works and traffic). These effects may be significant in areas where there are existing quality of life issues. However, the effects on this aspect of the objective are deemed to be uncertain until the location of SDP facilities is known.

Decommissioning activities may temporarily affect the attractiveness of surrounding areas to existing and prospective residents and businesses as a result of adverse impacts on visual amenity and increased noise, vibration and dust (for example, as a result of the operation of plant equipment and HGV movements). However, as these effects are expected to be only temporary it is not envisaged that they would have a significant effect on this aspect of the objective.

Although the decommissioning activities themselves will provide jobs in the short term the cessation of operational activities will result in a decrease in employment opportunities associated with the dismantling of submarines and interim storage which could result in an increase in local unemployment although this is dependent on a number of factors including the characteristics of the local labour market when operational activities are ceased, the extent to which posts were occupied by the local community and the potential for redeployment of affected staff.

Stage VII: Decommission SDP Facilities Population	
However, SDP operations are not expected to support a significant number of jobs, so the long-term effects are unlikely to be significant. **Technical Options:** The total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. RC storage will require decommissioning of a relatively large interim ILW storage facility compared to RPV and Packaged Waste options and, on a greenfield site, removal of docking facilities would also be required. This may increase the potential for, and magnitude of, disruption to local transport networks and users in the vicinity of the interim storage facility as both the scale and duration of works are expected to be greater. However, it is assumed that as a RC storage facility would be located at the coast, some wastes and equipment would be transported to/from the site by sea which could serve to minimise any negative effects. Decommissioning of a RC storage facility constructed on a greenfield site may also increase the severity of effects on quality of life associated with noise, vibration and air quality from HGV movements and the use of plant equipment relative to RPV and Packaged Waste options. These impacts may also adversely affect the attractiveness of surrounding areas to existing and prospective residents and businesses. However, the effects on this aspect of the objective are deemed to be uncertain until the location of the interim storage facility has been identified although it can be assumed that, as any adverse impacts would only be temporary, it is unlikely that they would be significant. As the scale and duration of decommissioning activities are expected to be greater for decommissioning of a RC storage facility, the capital spend and, consequently, level of economic benefit (i.e. the number of jobs and local supply chain benefits) generated would also be greater compared to RPV and Packaged Waste options. However, the extent to which this benefits the local community would still be dependent on the type of posts created, the characteristics of the local labour market and the recruitment/procurement policies of the contractors employed to undertake the work as well as the requirements imposed by the MOD. **Proposed Mitigation / Enhancements Measures:** • Where possible, staff affected by the cessation of operational activity should be redeployed and any appropriate training provided. Where redeployment is not possible, the MOD/contractors should support affected staff (e.g. through re-training in liaison with local employment agencies). • Any opportunities to employ local contractors and individuals for decommissioning works or for the use of suppliers should be identified, although due consideration and adherence to employment legislation is required (e.g. no discrimination on any grounds). Any potential to offer training opportunities (e.g. apprenticeship schemes) should be pursued. • Any increase in demand for services and accommodation arising from the works and its potential effect on the existing community should be considered carefully.	
Summary: The cessation of operational activities will result in a decrease in employment opportunities associated with the dismantling of submarines and interim ILW storage which could result in an increase in local unemployment which would have a negative effect on this objective, although this is dependent on the characteristics of the local labour market, opportunities for the redeployment of affected staff and the extent to which posts were filled by the local community. However, during the decommissioning activities Option 1 is also expected to generate a significant number employment opportunities for the duration of the decommissioning works, reflecting both the scale and duration of works required to return SDP sites to a greenfield end state. However, the extent to which these posts *do* directly benefit the local community will depend on the specific employment opportunities, the local labour market and the employment practices of the lead contractor. There may also be potential to ensure that decommissioning offers training opportunities (e.g. apprenticeship schemes). Decommissioning activities are expected to stimulate wider local economic benefits through the use of local supply chains although the magnitude of these benefits will be dependent on the procurement practices of the MOD and lead contractor. Decommissioning, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to the national economy. The level of economic benefit generated under this option may vary depending upon the type of interim storage facility	**-/++**

Stage VII: Decommission SDP Facilities Population	
constructed and subsequently decommissioned. In this respect, it is anticipated that the spend and number of employment opportunities related to the decommissioning of a RC storage facility would be greater than for RPV and Packaged Waste options reflecting both the increased scale and duration of works likely to be required under this technical option. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from decommissioning activities (e.g. associated with the increased noise, vibration and air quality effects from the works and traffic). The severity of these effects in the vicinity of the interim storage facility may be increased should the RC option be implemented which reflects the scale and duration of works likely to be required under this technical option. However, the effects on this aspect of the objective are deemed to be uncertain until the location of SDP facilities has been identified although it can be assumed that, as any adverse impacts only be temporary, it is unlikely that they would be significant.	

Option 2: Decommission Brownfield Sites

Assessment of Effects:

The type and range of effects identified in relation to Option 1 are expected to be similar for the decommissioning of SDP facilities constructed on brownfield sites. However, both the duration and scale of works would be reduced as it is assumed that hardstanding and some infrastructure (e.g. docking facilities and roads) would be retained. Consequently, disruption to local transport networks (and users) as a result of works traffic during decommissioning may be less although for those individuals or communities that experience disruption, it is recognised that this may not be the perception.

Under this option there is considered to be greater potential (relative to Option 1) for negative economic effects associated with the cessation of operational activities (e.g. loss of jobs) to be in part offset by the development of new economic uses on SDP sites. This reflects the objectives of current national planning policy which seek to direct new economic development towards previously developed land although as the extent of potential future employment creation following decommissioning is unknown, this effect is considered to be uncertain. As the scale and duration of decommissioning activity is expected to be reduced under this option, the number of employment opportunities and wider economic benefits associated with decommissioning activities would be less than for Option 1.

In view of the reduced scale and duration of works associated with this option, the risk of decommissioning activities affecting quality of life may be less compared to Option 1. However, it is assumed that brownfield sites would be located within or adjacent to an existing settlement and as such there may be greater potential for such sites to be in close proximity to sensitive receptors and within sensitive areas such as AQMAs. However, the effects on this aspect of the objective are deemed to be uncertain until the location of SDP sites has been identified.

Technical Options:

The total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim ILW storage facility compared to RPV and Packaged Waste options. This may increase the potential for, and magnitude of, disruption to local transport networks and users in the vicinity of the interim storage facility as both the scale and duration of works are expected to be greater. However, it is assumed that as a RC storage facility would be located at the coast, some wastes and equipment would be transported to/from the site by sea which could serve to minimise any negative effects.

Decommissioning of a RC storage facility may also increase the severity of effects on quality of life associated with noise, vibration and air quality from HGV movements and the use of plant equipment relative to RPV and Packaged Waste options. These impacts may also adversely affect the attractiveness of surrounding areas to existing and prospective residents and businesses. However, the effects on this aspect of the objective are deemed to be uncertain until the location of the interim storage facility has been identified although it can be assumed that, as any adverse impacts would only be temporary, it is unlikely that they would be significant.

As the scale and duration of decommissioning activities are expected to be greater for decommissioning of a RC storage facility, the capital spend and, consequently, level of economic benefit (i.e. the number of jobs and local supply chain benefits) generated would also be greater compared to RPV and Packaged Waste options. However, the extent to which this benefits the local community would still be dependent on the type of posts created, the characteristics of the local labour market and the recruitment/procurement policies of the contractors employed to undertake the work as well as the requirements imposed by the MOD.

Stage VII: Decommission SDP Facilities Population	
Proposed Mitigation / Enhancements Measures: • No additional measures beyond those proposed for Option 1.	
Summary: The type and range of effects identified in relation to Option 1 are expected to be similar for the decommissioning of SDP facilities constructed on brownfield sites. The cessation of operational activities will result in a decrease in employment opportunities associated with the processing of submarines and interim storage which could result in an increase in local unemployment although this is dependent on the characteristics of the local labour market, opportunities for the redeployment of affected staff and the extent to which posts were filled by the local community. There may also be opportunities for the development of new economic uses on the site(s) which could in part offset these effects. In the shorter term Option 2 is expected to generate a significant number of employment opportunities for the duration of the decommissioning works. However, the extent to which these posts *do* directly benefit the local community will depend on the specific employment opportunities, the local labour market and the employment practices of the lead contractor. Decommissioning activities may also provide wider local economic benefits through the use of local supply chains although the magnitude of these benefits will be dependent on the procurement practices of the MOD and lead contractor. Decommissioning, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to the national economy. The level of economic benefit generated under this option may vary depending upon the type of interim storage facility constructed and subsequently decommissioned. In this respect, it is anticipated that the spend and number of employment opportunities related to the decommissioning of a RC storage facility would be greater than for RPV and Packaged Waste options reflecting both the increased scale and duration of works likely to be required under this technical option. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from decommissioning activities (e.g. associated with the increased noise, vibration and air quality effects from the works and traffic). The severity of these effects in the vicinity of the interim storage facility may be increased should the RC option be implemented which reflects the scale and duration of works required under this technical option. However, the effects on this aspect of the objective are deemed to be uncertain until the location of SDP facilities has been identified although it can be assumed that, as any adverse impacts would only be temporary, it is unlikely that they would be significant.	**-/++/?**
Option 3: Decommission Licensed/Authorised Sites	
Assessment of Effects: The type and range of effects identified in relation to Option 3 are expected to be similar to those identified for Option 2. However, there would be a reduction in their duration and magnitude which reflects the assumption that hardstanding, infrastructure (and potentially some ancillary facilities) would be retained following decommissioning. Under this option SDP sites, once decommissioned, may be redeveloped for related or similar uses (i.e. uses which must be Licensed or Approved by the UK nuclear regulators) creating employment opportunities which could require similar skill sets to those during the operational phase of the SDP process. This may help offset negative effects associated with the cessation of operational activities should staff affected be recruited into the new positions created although the potential for these benefits to be realised depends on the duration of decommissioning activities vis-à-vis the loss of specialist skill sets in the local labour market over time and the type of redevelopment which takes place. Consequently any effects are considered to be uncertain. **Technical Options:** As the range of potential effects on this objective are expected to be similar to (or less than) Options 1 and 2, the influence of the technical options on their severity is also expected to be similar.	

Stage VII: Decommission SDP Facilities Population	
Proposed Mitigation / Enhancements Measures: • No additional measures beyond those proposed for Option 1.	
Summary: The type, range and magnitude of effects identified in relation to Option 3 are expected to be similar to those associated with decommissioning SDP facilities constructed on Licensed/Authorised sites. The cessation of operational activities will result in a decrease in employment opportunities associated with the dismantling of submarines and interim storage which could result in an increase in local unemployment although this is dependent on the characteristics of the local labour market, opportunities for the redeployment of affected staff and the extent to which posts were filled by the local community. Under this option SDP sites, once decommissioned, may be redeveloped for related or similar uses (i.e. uses which must be Licensed or Approved by the UK nuclear regulators) creating employment opportunities which could require similar skill sets to those during the operational phase of the SDP process. This may help offset negative effects associated with the cessation of operational activities. Further, Option 3 is expected to generate a significant number of employment opportunities for the duration of the decommissioning works. However, the extent to which these posts *do* directly benefit the local community will depend on the specific employment opportunities, the local labour market and the employment practices of the lead contractor. Decommissioning activities may also stimulate wider local economic benefits through the use of local supply chains although the magnitude of these benefits will be dependent on the procurement practices of the MOD and lead contractor. Decommissioning, as part of the wider SDP process, will generate financial savings by reducing costs associated with current afloat storage which will have a positive effect in relation to the national economy. The level of economic benefit generated under this option may vary depending upon the type of storage facility constructed and subsequently decommissioned. In this respect, it is anticipated that the spend and number of employment opportunities related to the decommissioning of a RC storage facility would be greater than for RPV and Packaged Waste options reflecting both the increased scale and duration of works under this technical option. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from decommissioning activities (e.g. associated with the increased noise, vibration and air quality effects from the works and traffic). The severity of these effects in the vicinity of the storage facility may be increased should the RC option be implemented which reflects the scale and duration of works likely to be required under this technical option. However, the effects on this aspect of the objective are deemed to be uncertain until the location of SDP facilities has been identified although it can be assumed that, as any adverse impacts only be temporary, it is unlikely that they would be significant.	**-/++/?**

2.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the population objective. **Box 2.2** provides a summary of the options that have been assessed.

Box 2.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 2.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts.	-/+	-/+	-/+	**Potential Effects** No effects on existing community facilities/amenities are anticipated at the Devonport or Rosyth dockyards, assuming that SDP activities would take place within the nuclear licensed site at the Devonport and Rosyth dockyards. There may be a negative effect on quality of life from SDP activities and associated traffic movements including noise, vibration and emissions predominantly affecting areas around the dockyards and alongside local transport networks. However, as the Devonport and Rosyth dockyards are operational dockyards and assuming that SDP activities would take place within the nuclear licensed site of the dockyards away from local populations, disturbance to local communities is expected to be minor and primarily related to transport movements to and from the dockyards (the movement of construction materials, general wastes, LLW and ILW – refer to J. Material Assets (Transport)). However, no significant impacts are anticipated taking account of the estimated transport movements, which are unlikely to result in a discernable increase in traffic on the local road network, and may be reduced should equipment, materials and waste be transported by sea. The opportunity exists at both the Devonport and Rosyth dockyards to utilise existing rail and port facilities. Modifications to existing facilities and infrastructure and new build is required at both the Devonport and Rosyth dockyards to accommodate SDP activities. This could generate some local employment opportunities; although given the scale of potential development any employment generated is expected to be minor. At this stage, estimates of the number of jobs associated with construction and eventual decommissioning have not been available. The RC option is estimated to generate between 80-135 employment opportunities for the duration of the SDP. Initial dismantling (RC cut-out) is estimated to require 20-30 FTE. The majority of jobs created would require skill sets similar to those associated with ship recycling as the option does not involve intrusion into the RPV. At RC cut-out stage, only a small proportion of opportunities created would be highly skilled as the requirement for specialist nuclear expertise would be limited. RC interim storage is estimated to require up to 5 FTEs. A further 55-100 employment opportunities would be created in the longer term when full dismantling and size reduction takes place: an estimated 30-60 FTE for removal of the RPV from the RC following interim storage, 20-30 FTE for RPV size reduction, and 5-10 FTE for final packaging of ILW into proposed GDF compliant packaging. As the Devonport and Rosyth dockyards are licensed and conduct similar activities to those required for some aspects of the SDP, it is likely that there would be a pre-existing local pool of appropriately skilled individuals. Consequently, there is a potential for economic benefits associated with SDP activities to be realised locally. Nonetheless, the extent to which local benefits would be realised depends on the recruitment policies of the MOD and of contractors and unless clear contract direction was given to ensure that members of the local community were given preference, the employment opportunities created may not benefit the local community to any substantial extent. There may be potential to offer training opportunities associated with SDP activities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from the National Apprenticeship Service (NAS). Any spend associated with SDP activities may lead to an increase in investment in local supply chains, fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. There may also be minor local economic benefits associated with employee spend (in terms of temporary accommodation, consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated.

Assessment Criteria	Score			Commentary
	1D	1R	1B	
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	The extent to which SDP activities could benefit the local economy will depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. Whilst SDP activities will incur costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net economic benefit in relation to national public expenditure. The level of development required (and employment opportunities created) at the Devonport and Rosyth dockyards is not of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing. There is considerable local public interest in the SDP and the use of the Devonport and Rosyth dockyards for SDP activities, with members of the public and local community expressing concern regarding the proposals, and as such it is anticipated that dismantling activities at the Devonport and Rosyth dockyards could be perceived negatively in the short term. However, it is not anticipated that initial dismantling activities would significantly alter perceptions of the attractiveness of the surrounding areas to existing and prospective residents and businesses once dismantling activities have begun, as the Devonport and Rosyth dockyards are operational dockyards and nuclear licensed sites, and the initial dismantling activities would be of a similar nature to existing activities taking place and consistent with the character of the existing dockyards. Notwithstanding this, there is the potential for effects in the long term, depending on how the storage of radioactive waste at the Devonport and Rosyth dockyards is perceived. On the one hand, as the facility is to be located within an existing nuclear licensed site this may be viewed as a continuation of existing use. On the other hand, some may perceive this as unfairly adding to licensed activities already taking place within a locality further undermining the attractiveness of the area to both current and prospective residents and businesses. Of the technical options, taking account of interim storage requirements the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2. Notwithstanding this, in the case of the RC option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation and size reduction of the RC would not take place until the interim storage period is nearing completion. This would mean that construction would be spread over two phases rather than one period. This phasing could have a positive effect in relation to employment, creating job opportunities over two generations which could benefit different businesses and employees. Separating activities into two phases may also help to minimise any disturbance to local populations. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur. In addition, the benefits of economies of scale may not be realised. In the case of the RC option, it is noted there is a risk that suitably qualified and experienced persons (SQEP) would not be available to undertake the final segregation and size reduction of the RC given a potential gap between nuclear related jobs and skills in the future and the loss of current operator knowledge and experience of nuclear submarine reactors. The longer dismantling activities are delayed, the greater the risk that knowledge of existing processes and the industrial skill set will be lost. <u>Devonport Dockyard</u> Devonport dockyard is located adjacent to the Hamoaze estuary on the western fringe of the city of Plymouth. The Devonport dockyard is owned and operated by the Babcock Marine Division of Babcock International. The naval base provides full operational support to the Royal Navy's surface ships and submarines and also includes naval barracks. Devonport dockyard is also the UK's sole refitting and defuelling site for nuclear powered submarines. Devonport Yachts, who build large superyachts and luxury motor yachts, operate to the south of the Devonport dockyard and are also part of the Babcock Marine

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				Division.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The Plymouth Navy Days event is also held at the Devonport Naval Base every two years for visitors to view the Royal Navy and foreign ships, which attracts up to 50,000 people. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. The Devonport ferry terminal for the Torpoint Ferry crossing is located to the south of the dockyard, which links the city of Plymouth to the town of Torpoint. International ferries to France and Spain route from Millbay Docks (located approximately 6km to the south-east of Devonport dockyard) across the Sound and into the English Channel. Private vessels moor along the Plymouth Sound, including in the Hamoaze to the west of Devonport dockyard. There are marinas at Sutton Harbour, Mount Wise in Hamoaze and at Turnchapel. Fishing vessels are understood to dock at Sutton Harbour. In 2001 the population of Devonport ward, in which Devonport dockyard is situated, was 14,287 people, with a population density of 37.5 people per hectare. The population of Devonport ward is predominantly of working age with 68.37% of the population aged 14-64 years (compared to 65.77% for Plymouth as a whole), 20.51% of the population aged 0-14 years (18.24% for Plymouth), and 11.12% of the population aged 65 years and over (15.98% for Plymouth). In 2010, Plymouth ranked 72 of 354 local authorities in England in the Indices of Multiple Deprivation. There are eight wards surrounding Devonport dockyard: Devonport, Ham, Stoke, St Budeaux, Saltash Essa, Rame, Torpoint East and Torpoint West. Within these wards, 64.80% of the population is aged 15-64 years, 20.01% is aged 0-14 years and 15.19% of the population is aged 65 years and over. An assessment of populations around Devonport dockyard has been calculated in an Outline Environmental Statement for the dockyard prepared to inform the SDP. This determined that there are 40,455 people within 2km of Devonport dockyard (from 9 Dock): of which 297 people are within 0-0.55km, 6,376 people are within 0.55-1km, and 33,782 people within 2km. At the time of reporting, the approximate number of service and non-service personnal working within the Naval Base boundaries was 12,658 people. There is the potential for SDP activities at Devonport dockyard to impact on local populations and visitors to the dockyard. However, as the Devonport dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site away from local populations, disturbance to local communities and businesses is expected to be minor and primarily related to transport movements to and from the dockyard, which, taking account of estimated transport movements and the timescales of the project are anticipated to have a negligible impact on the amenity of local residents along local transport routes from Devonport dockyard. <u>Rosyth Dockyard</u> Rosyth dockyard is located adjacent to the Firth of Forth estuary to the south-west of the town of Rosyth. The Rosyth dockyard is owned and operated by the Babcock Marine Division of Babcock International, and primarily undertakes refitting of Royal Navy surface vessels. Previously the Rosyth dockyard was also a refitting and defuelling site for nuclear powered submarines; however these operations ceased in 2003. It is understood that Rosyth dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. The Port of Rosyth, and the Rosyth Ferry

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				Terminal is located just south-east of the Rosyth dockyard. The Ferry Terminal links Scotland directly to the Belgium mainland.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	In 2001, the population of Rosyth ward, in which Rosyth dockyard is situated, was 13,637 people. The population of Rosyth ward is predominantly of working age with 62.89% of the population aged 15-64 years (compared to 61.44% for Fife), 22.72% aged 0-14 years (19.64% for Fife), and 14.39% of the population aged 65 years and over (18.92% for Fife). There are four wards surrounding Rosyth dockyard: Rosyth, West Fife & Coastal Villages, Inverkeithing & Dalgety Bay and Linlithgow. Within these wards, 66.93% of the population is aged 15-64 years, 20.13% is aged 0-14 years and 12.93% of the population is aged 65 years and over. In 2009, the area in which Rosyth dockyard is situated was in the 40%-50% most deprived data zones in Scotland, and parts of the town of Rosyth and neighbouring town of Inverkeithing was in the 10%-20% most deprived data zones. There is the potential for SDP activities at Rosyth dockyard to impact on local populations. However, as the Rosyth dockyard is an operational dockyard and assuming that SDP activities would take place within the dockyards away from local populations, disturbance to local communities and businesses is expected to be minor and primarily related to transport movements to and from the dockyards, which, taking account of estimated transport movements and the timescales of the project are anticipated to have a negligible impact on the amenity of local residents along transport routes. Traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing. Further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Devonport dockyard is located in the city of Plymouth in a densely populated and built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. The ward in which Devonport dockyard is situated is more densely populated that that of Rosyth ward, but a greater percentage of the population is of working age. A greater percentage of the population in Rosyth ward are children and pensioners when compared to Devonport ward. In the wards adjacent to and surrounding Devonport dockyard however, a greater percentage of the population are children and pensioners when compared to the wards surrounding Rosyth dockyard. Taking account of the location of the Devonport and Rosyth dockyards, surrounding land uses and transport routing to/from the dockyards, along with the scale of development required there is considered to be a greater potential for SDP activities at Devonport dockyard to affect local populations when compared to Rosyth dockyard, due to the proximity of the dockyard to densely populated residential areas, the requirement to route traffic through the outskirts of the city and the scale of development required. Rosyth dockyard is situated in a more isolated location with good transport links, and therefore fewer sensitive receptors could be affected. Notwithstanding this, any impact on the amenity of local residents as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be negligible. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Plymouth to impact on the amenity of local populations associated with the transport of waste. Notwithstanding

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any impact on local populations from LLW transportation is anticipated to be negligible.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would create additional construction employment opportunities and would benefit two local economies. It is also noted that utilising both sites would enable faster dismantling of submarines, which could generate financial savings by reducing costs associated with current afloat storage. Notwithstanding this, costs associated with construction would be higher, as facilities for SDP activities would need to be constructed at both sites.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts.	-/+	-/+	-/+	**<u>Potential Effects</u>** No effects on existing community facilities/amenities are anticipated at the Devonport or Rosyth dockyards, assuming that SDP activities would take place within the nuclear licensed site at the Devonport and Rosyth dockyards. There may be a negative effect on quality of life from SDP activities and associated traffic movements including noise, vibration and emissions predominantly affecting areas around the dockyards and alongside local transport networks. However, as the Devonport and Rosyth dockyards are operational dockyards and assuming that SDP activities would take place within the nuclear licensed site of the dockyards away from local populations, disturbance to local communities is expected to be minor and primarily related to transport movements to and from the dockyards (the movement of construction materials, general wastes, and LLW and ILW – refer to J. Material Assets (Transport)). However, no significant impacts are anticipated taking account of the estimated transport movements, which are unlikely to result in a discernable increase in traffic on the local road network, and may be reduced should equipment, materials and waste be transported by sea. The opportunity exists at both the Devonport and Rosyth dockyards to utilise existing rail and port facilities. Modifications to existing facilities and infrastructure and new build is required at both the Devonport and Rosyth dockyards to accommodate SDP activities. This could generate some local employment opportunities; although given the scale of potential development any employment generated is expected to be minor. Estimates of the number of jobs associated with construction and eventual decommissioning have not been available. The RPV option is estimated to generate between 60-105 employment opportunities for the duration of the SDP (which is expected to take place over approximately 27 years). Initial dismantling (de-planting and packaging the RPV) is estimated to require 30-60 FTE. RPV interim storage is estimated to require up to 5 FTEs. A further 25-40 employment opportunities would be created in the longer term when full segregation and size reduction takes place: an estimated 20-30 FTE for RPV segregation following interim storage, and 5-10 FTE for final packaging of ILW into proposed GDF compliant packaging. As the Devonport and Rosyth dockyards are licensed and conduct similar activities to those required for some aspects of the SDP, it is likely that there would be a pre-existing local pool of appropriately skilled individuals. Consequently, there is a potential for economic benefits associated with SDP activities to be realised locally. Nonetheless, the extent to which local benefits would be realised depends on the recruitment policies of the MOD and of contractors and unless clear contract direction was given to ensure that members of the local community were given preference, the employment opportunities created may not benefit the local community to any substantial extent. There may be potential to offer training opportunities associated with SDP activities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from the NAS. Any spend associated with SDP activities may lead to an increase in investment in local supply chains, fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. There may also be minor local economic benefits associated with employee spend (in terms of temporary accommodation, consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated. The extent to which SDP activities could benefit the local economy will depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. Whilst SDP activities will incur costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				will be a net economic benefit in relation to national public expenditure.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	The level of development required (and employment opportunities created) at the Devonport and Rosyth dockyards, it is not of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing. There is considerable local public interest in the SDP and the use of the Devonport and Rosyth dockyards for SDP activities, with members of the public and local community expressing concern regarding the proposals, and as such it is anticipated that dismantling activities at the Devonport and Rosyth dockyards could be perceived negatively in the short term. However, it is not anticipated that dismantling activities would significantly alter perceptions of the attractiveness of the surrounding areas to existing and prospective residents and businesses once dismantling activities have begun, as the Devonport and Rosyth dockyards are operational dockyards and nuclear licensed sites, and the dismantling activities would be of a similar nature to existing activities taking place and consistent with the character of the existing dockyards. Notwithstanding this, there is the potential for effects in the long term, depending on how the storage of radioactive waste at the Devonport and Rosyth dockyards is perceived. On the one hand, as the facility is to be located within an existing nuclear licensed site this may be viewed as a continuation of existing use. On the other hand, some may perceive this as unfairly adding to licensed activities already taking place within a locality further undermining the attractiveness of the area to both current and prospective residents and businesses. Of the technical options, the scale of development required for the RPV option would be smaller than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2 and therefore the level of disturbance to local populations could be less. In addition, in the case of the RPV option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for segregation and size reduction would not take place until the interim storage period is nearing completion. This phasing could have a positive effect in relation to employment, creating job opportunities over two generations which could benefit different businesses and employees. Separating activities into two phases may also help to minimise any disturbance to local populations. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur. In addition, the benefits of economies of scale may not be realised. In the case of the RPV option, it is noted there is a risk that SQEP would not be available to undertake the final segregation and size reduction of the RPV given a potential gap between nuclear related jobs and skills in the future and the loss of current operator knowledge and experience of nuclear submarine reactors. The longer dismantling activities are delayed, the greater the risk that knowledge of existing processes and the industrial skill set will be lost. <u>Devonport Dockyard</u> Devonport dockyard is located adjacent to the Hamoaze estuary on the western fringe of the city of Plymouth. The Devonport dockyard is owned and operated by the Babcock Marine Division of Babcock International. The naval base provides full operational support to the Royal Navy's surface ships and submarines and also includes naval barracks. Devonport dockyard is also the UK's sole refitting and defuelling site for nuclear powered submarines. Devonport Yachts, who build large superyachts and luxury motor yachts, operate to the south of the Devonport dockyard and are also part of the Babcock Marine Division. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The Plymouth Navy Days event is also held at the Devonport Naval Base every two years for visitors to view the Royal Navy and foreign ships, which attracts up to 50,000 people. The former nuclear-powered submarine Courageous has

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set open weekends throughout the year.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. The Devonport ferry terminal for the Torpoint Ferry crossing is located to the south of the dockyard, which links the city of Plymouth to the town of Torpoint. International ferries to France and Spain route from Millbay Docks (located approximately 6km to the south-east of Devonport dockyard) across the Sound and into the English Channel. Private vessels moor along the Plymouth Sound, including in the Hamoaze to the west of Devonport dockyard. There are marinas at Sutton Harbour, Mount Wise in Hamoaze and at Turnchapel. Fishing vessels are understood to dock at Sutton Harbour. In 2001 the population of Devonport ward, in which Devonport dockyard is situated, was 14,287 people, with a population density of 37.5 people per hectare. The population of Devonport ward is predominantly of working age with 68.37% of the population aged 14-64 years (compared to 65.77% for Plymouth as a whole), 20.51% of the population aged 0-14 years (18.24% for Plymouth), and 11.12% of the population aged 65 years and over (15.98% for Plymouth). In 2010, Plymouth ranked 72 of 354 local authorities in England in the Indices of Multiple Deprivation. There are eight wards surrounding Devonport dockyard: Devonport, Ham, Stoke, St Budeaux, Saltash Essa, Rame, Torpoint East and Torpoint West. Within these wards, 64.80% of the population is aged 15-64 years, 20.01% is aged 0-14 years and 15.19% of the population is aged 65 years and over. An assessment of populations around Devonport dockyard has been calculated in an Outline Environmental Statement for the dockyard prepared to inform the SDP. This determined that there are 40,455 people within 2km of Devonport dockyard (from 9 Dock): of which 297 people are within 0-0.55km, 6,376 people are within 0.55-1km, and 33,782 people within 2km. At the time of reporting, the approximate number of service and non-service personnal working within the Naval Base boundaries was 12,658 people. There is the potential for SDP activities at Devonport dockyard to impact on local populations and visitors to the dockyard. However, as the Devonport dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site away from local populations, disturbance to local communities and businesses is expected to be minor and primarily related to transport movements to and from the dockyard, which, taking account of estimated transport movements and the timescales of the project are anticipated to have a negligible impact on the amenity of local residents along local transport routes from Devonport dockyard. <u>Rosyth Dockyard</u> Rosyth dockyard is located adjacent to the Firth of Forth estuary to the south-west of the town of Rosyth. The Rosyth dockyard is owned and operated by the Babcock Marine Division of Babcock International, and primarily undertakes refitting of Royal Navy surface vessels. Previously the Rosyth dockyard was also a refitting and defuelling site for nuclear powered submarines; however these operations ceased in 2003. It is understood that Rosyth dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. The Port of Rosyth, and the Rosyth Ferry Terminal is located just south-east of the Rosyth dockyard. The Ferry Terminal links Scotland directly to the Belgium mainland. In 2001, the population of Rosyth ward, in which Rosyth dockyard is situated, was 13,637 people. The population of Rosyth ward is predominantly of working age with 62.89% of the population aged 15-64 years (compared to 61.44% for Fife), 22.72% aged 0-14 years

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				(19.64% for Fife), and 14.39% of the population aged 65 years and over (18.92% for Fife). There are four wards surrounding Rosyth dockyard: Rosyth, West Fife & Coastal Villages, Inverkeithing & Dalgety Bay and Linlithgow. Within these wards, 66.93% of the population is aged 15-64 years, 20.13% is aged 0-14 years and 12.93% of the population is aged 65 years and over.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	In 2009, the area in which Rosyth dockyard is situated was in the 40%-50% most deprived data zones in Scotland, and parts of the town of Rosyth and neighbouring town of Inverkeithing was in the 10%-20% most deprived data zones. There is the potential for SDP activities at Rosyth dockyard to impact on local populations. However, as the Rosyth dockyard is an operational dockyard and assuming that SDP activities would take place within the dockyards away from local populations, disturbance to local communities and businesses is expected to be minor and primarily related to transport movements to and from the dockyards, which, taking account of estimated transport movements and the timescales of the project are anticipated to have a negligible impact on the amenity of local residents along transport routes. Traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing. Further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Option 2D could therefore potentially have a greater impact on local populations associated with construction activities. Devonport dockyard is located in the city of Plymouth in a densely populated and built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. The ward in which Devonport dockyard is situated is more densely populated that that of Rosyth ward, but a greater percentage of the population is of working age. A greater percentage of the population in Rosyth ward are children and pensioners when compared to Devonport ward. In the wards adjacent to and surrounding Devonport dockyard however, a greater percentage of the population are children and pensioners when compared to the wards surrounding Rosyth dockyard. Taking account of the location of the Devonport and Rosyth dockyards, surrounding land uses and transport routing to/from the dockyards, along with the scale of development required there is considered to be a greater potential for SDP activities at Devonport dockyard to affect local populations when compared to Rosyth dockyard, due to the proximity of the dockyard to densely populated residential areas, the requirement to route traffic through the outskirts of the city and the scale of development required. Rosyth dockyard is situated in a more isolated location with good transport links, and therefore fewer sensitive receptors could be affected. Notwithstanding this, any impact on the amenity of local residents as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be negligible. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Devonport dockyard to impact on the amenity of local populations associated with the transport of waste. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any impact on local populations from LLW transportation is anticipated to be negligible.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	<u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would create additional construction employment opportunities and would benefit two local economies. It is also noted that utilising both sites would enable faster initial dismantling of the existing laid-up submarines, which could generate financial savings by reducing costs associated with current afloat storage. Notwithstanding this, costs associated with construction would be higher, as facilities for SDP activities would need to be constructed at both sites.

Options 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts.	-/?/+	-/?/+	-/?/+	**Potential Effects** Dismantling activities at the Devonport and Rosyth dockyards are not anticipated to have any effects on existing community facilities/amenities, assuming that dismantling activities would take place within the nuclear licensed site at the Devonport and Rosyth dockyards. There may be a negative effect on quality of life from dismantling activities and associated traffic movements including noise, vibration and emissions predominantly affecting areas around the dockyards and alongside local transport networks. However, as the Devonport and Rosyth dockyards are operational dockyards and assuming that dismantling activities would take place within the nuclear licensed site of the dockyards away from local populations, disturbance to local communities associated with dismantling activities is expected to be minor and primarily related to transport movements to and from the dockyards (the movement of construction materials, general wastes and some LLW – refer to J. Material Assets (Transport)). However, no significant impacts are anticipated taking account of the estimated transport movements, which are unlikely to result in a discernable increase in traffic on the local road network, and may be reduced should equipment, materials and waste be transported by sea. The opportunity also exists at both the Devonport and Rosyth dockyards to utilise existing rail and port facilities. In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation/size reduction (full dismantling of the RPV). Depending on the location of the remote site there is the potential for the construction of the interim storage area and segregation/size reduction facilities to impact on local populations, e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic. Assuming that the remote site is operational and access is restricted, disturbance to local communities is anticipated to be minor and primarily related to transport movements to and from the remote site (the movement of construction materials, general wastes, the transport of the RPVs to site, and the transport of ILW and some LLW off-site). However, at this stage a site has not been identified and subsequently the effect of interim storage and segregation/size reduction activities on populations cannot be determined at this stage. Modifications to existing facilities and infrastructure and new build is required at both the Devonport and Rosyth dockyards to accommodate dismantling activities. Similarly, modifications to existing facilities/infrastructure and new build is likely to be required at the remote site to accommodate interim storage and segregation/size reduction activities. As a remote site has not been identified the level of construction required cannot be determined at this stage. However, it is assumed that as a minimum an interim storage area would need to be constructed. This could generate some local employment opportunities; although given the scale of potential development any employment generated is expected to be minor. Estimates of the number of jobs associated with construction and eventual decommissioning have not been available. The RPV option is estimated to generate between 60-105 employment opportunities for the duration of the SDP (which is expected to take place over approximately 27 years). Initial dismantling (de-planting and packaging the RPV) is estimated to require 30-60 FTE. RPV interim storage is estimated to require up to 5 FTEs. A further 25-40 employment opportunities would be created in the longer term when full segregation and size reduction takes place: an estimated 20-30 FTE for RPV segregation following interim storage, and 5-10 FTE for final packaging of ILW into proposed GDF compliant packaging. As the Devonport and Rosyth dockyards are licensed and conduct similar activities to those required for some aspects of the SDP, it is likely that there would be a pre-existing local pool of appropriately skilled individuals. Consequently, there is a potential for economic benefits associated with dismantling activities to be realised locally. There could also be the potential for employment opportunities associated with interim storage and size reduction

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				activities to benefit local communities, depending on the availability of appropriately skilled individuals.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	- /?/+	- /?/+	- /?/+	The extent to which local benefits would be realised depends on the recruitment policies of the MOD and of contractors and unless clear contract direction was given to ensure that members of the local community were given preference, the employment opportunities created may not benefit the local community to any substantial extent. There may be potential to offer training opportunities associated with SDP activities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from the NAS. Any spend associated with SDP activities may lead to an increase in investment in local supply chains, fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. There may also be minor local economic benefits associated with employee spend (in terms of temporary accommodation, consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated. The extent to which SDP activities could benefit the local economy will depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. The level of development required (and employment opportunities created) at the Devonport and Rosyth dockyards is not expected to be of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing. Irrespective of the eventual location of the remote site, the interim storage and segregation activities would also not be of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing. There is considerable local public interest in the SDP and the use of the Devonport and Rosyth dockyards for SDP activities, with members of the public and local community expressing concern regarding the proposals, and as such it is anticipated that dismantling activities at the Devonport and Rosyth dockyards could be perceived negatively in the short term. However, it is not anticipated that dismantling activities would significantly alter perceptions of the attractiveness of the surrounding areas to existing and prospective residents and businesses once dismantling activities have begun, as the Devonport and Rosyth dockyards are operational dockyards and nuclear licensed sites, and the dismantling activities would be of a similar nature to existing activities taking place and consistent with the character of the existing dockyards. The potential for the storage of ILW and subsequent segregation activities to alter the perceptions of the attractiveness of area surrounding the remote site is at this stage unknown; however, will depend on the location of the site for interim storage and the extent to which interim storage and subsequent segregation/size reduction activities (or equivalent) are already undertaken at the site. Whilst SDP activities will incur costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net economic benefit in relation to national public expenditure. Of the technical options, the scale of development required for the RPV option would be smaller than the other options, with the RPV option requiring a new interimstorage area with a footprint of 801m^2 and therefore the level of disturbance to local populations could be less. In addition, construction would also take place on two different sites, benefiting two local economies. In the case of the RPV option construction of SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for size reduction of the RPV would not take place until the interim storage period is nearing completion. This phasing could have a positive effect in relation to employment, creating job opportunities over two generations which could benefit different businesses and employees. Separating activities into two phases may also help to minimise any

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				disturbance to local populations. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur, the benefits of economies of scale may not be realised.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/?/+	-/?/+	-/?/+	In the case of the RPV option, it is noted there is a risk that SQEP would not be available to undertake the final RPV size reduction given a potential gap between nuclear related jobs and skills in the future and the loss of current operator knowledge and experience of nuclear submarine reactors. The longer dismantling activities are delayed, the greater the risk that knowledge of existing processes and the industrial skill set will be lost. <u>Devonport Dockyard</u> Devonport dockyard is located adjacent to the Hamoaze estuary on the western fringe of the city of Plymouth. The Devonport dockyard is owned and operated by the Babcock Marine Division of Babcock International. The naval base provides full operational support to the Royal Navy's surface ships and submarines and also includes naval barracks. Devonport dockyard is also the UK's sole refitting and defuelling site for nuclear powered submarines. Devonport Yachts, who build large superyachts and luxury motor yachts, operate to the south of the Devonport dockyard and are also part of the Babcock Marine Division. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The Plymouth Navy Days event is also held at the Devonport Naval Base every two years for visitors to view the Royal Navy and foreign ships, which attracts up to 50,000 people. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set open weekends in the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. The Devonport ferry terminal for the Torpoint Ferry crossing is located to the south of the dockyard, which links the city of Plymouth to the town of Torpoint. International ferries to France and Spain route from Millbay Docks (located approximately 6km to the south-east of Devonport dockyard) across the Sound and into the English Channel. Private vessels moor along the Plymouth Sound, including in the Hamoaze to the west of Devonport dockyard. There are marinas at Sutton Harbour, Mount Wise in Hamoaze and at Turnchapel. Fishing vessels are understood to dock at Sutton Harbour. In 2001 the population of Devonport ward, in which Devonport dockyard is situated, was 14,287 people, with a population density of 37.5 people per hectare. The population of Devonport ward is predominantly of working age with 68.37% of the population aged 14-64 years (compared to 65.77% for Plymouth as a whole), 20.51% of the population aged 0-14 years (18.24% for Plymouth), and 11.12% of the population aged 65 years and over (15.98% for Plymouth). In 2010, Plymouth ranked 72 of 354 local authorities in England in the Indices of Multiple Deprivation. There are eight wards surrounding Devonport dockyard: Devonport, Ham, Stoke, St Budeaux, Saltash Essa, Rame, Torpoint East and Torpoint West. Within these wards, 64.80% of the population is aged 15-64 years, 20.01% is aged 0-14 years and 15.19% of the population is aged 65 years and over. An assessment of populations around Devonport dockyard has been calculated in an Outline Environmental Statement for the dockyard prepared to inform the SDP. This determined that there are 40,455 people within 2km of Devonport dockyard (from 9 Dock): of which 297 people are within 0-0.55km, 6,376 people are within 0.55-1km, and 33,782 people within 2km. At the time of reporting, the approximate number of service and non-service personnal working within the Naval Base boundaries was 12,658 people.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	- /?/+	- /?/+	- /?/+	There is the potential for SDP activities at Devonport dockyard to impact on local populations and visitors to the dockyard. However, as the Devonport dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site away from local populations, disturbance to local communities and businesses is expected to be minor and primarily related to transport movements to and from the dockyard, which, taking account of estimated transport movements and the timescales of the project are anticipated to have a negligible impact on the amenity of local residents along local transport routes from Devonport dockyard. Rosyth Dockyard Rosyth dockyard is located adjacent to the Firth of Forth estuary to the south-west of the town of Rosyth. The Rosyth dockyard is owned and operated by the Babcock Marine Division of Babcock International, and primarily undertakes refitting of Royal Navy surface vessels. Previously the Rosyth dockyard was also a refitting and defuelling site for nuclear powered submarines; however these operations ceased in 2003. It is understood that Rosyth dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. The Port of Rosyth, and the Rosyth Ferry Terminal is located just south-east of the Rosyth dockyard. The Ferry Terminal links Scotland directly to the Belgium mainland. In 2001, the population of Rosyth ward, in which Rosyth dockyard is situated, was 13,637 people. The population of Rosyth ward is predominantly of working age with 62.89% of the population aged 15-64 years (compared to 61.44% for Fife), 22.72% aged 0-14 years (19.64% for Fife), and 14.39% of the population aged 65 years and over (18.92% for Fife). There are four wards surrounding Rosyth dockyard: Rosyth, West Fife & Coastal Villages, Inverkeithing & Dalgety Bay and Linlithgow. Within these wards, 66.93% of the population is aged 15-64 years, 20.13% is aged 0-14 years and 12.93% of the population is aged 65 years and over. In 2009, the area in which Rosyth dockyard is situated was in the 40%-50% most deprived data zones in Scotland, and parts of the town of Rosyth and neighbouring town of Inverkeithing was in the 10%-20% most deprived data zones. There is the potential for SDP activities at Rosyth dockyard to impact on local populations. However, as the Rosyth dockyard is an operational dockyard and assuming that SDP activities would take place within the dockyards away from local populations, disturbance to local communities and businesses is expected to be minor and primarily related to transport movements to and from the dockyards, which, taking account of estimated transport movements and the timescales of the project are anticipated to have a negligible impact on the amenity of local residents along transport routes. Traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. **Comparison of the Options** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. Devonport dockyard is located in the city of Plymouth in a densely populated and built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. The ward in which Devonport dockyard is situated is more densely populated that that of Rosyth ward, but a greater percentage of the population is of working age. A greater percentage of the population in Rosyth ward are children and pensioners when compared to Devonport ward. In the wards adjacent to and surrounding Devonport dockyard however, a greater percentage of the population are children and pensioners when compared to the wards surrounding Rosyth dockyard.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/?/+	-/?/+	-/?/+	Taking account of the location of the Devonport and Rosyth dockyards, surrounding land uses and transport routing to/from the dockyards, along with the scale of development required there is considered to be a greater potential for SDP activities at Devonport dockyard to affect local populations when compared to Rosyth dockyard, due to the proximity of the dockyard to densely populated residential areas, the requirement to route traffic through the outskirts of the city and the scale of development required. Rosyth dockyard is situated in a more isolated location with good transport links, and therefore fewer sensitive receptors could be affected. Notwithstanding this, any impact on the amenity of local residents as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be negligible. At this stage a remote site for interim storage and segregation/size reduction has not been identified and subsequently the potential effect of these activities on populations is uncertain. The potential for effects would depend on the location of the remote site, the current range of interim storage and segregation/size reduction activities undertaken at the site, its proximity to local populations, the employment opportunities generated from interim storage and segregation activities, the local economy and employment market, and people's perceptions. Combination Option If both the Devonport and Rosyth dockyards are utilised for dismantling, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites for dismantling would create additional construction employment opportunities and would benefit two local economies. It is also noted that utilising both sites would enable faster initial dismantling of existing laid-up submarines, which could generate financial savings by reducing costs associated with current afloat storage. Notwithstanding this, costs associated with construction would be higher, as facilities for SDP activities would need to be constructed at both sites.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts.	-/+	-/+	-/+	**Potential Effects** No effects on existing community facilities/amenities are anticipated at the Devonport or Rosyth dockyards, assuming that SDP activities would take place within the nuclear licensed site at the Devonport and Rosyth dockyards. There may be a negative effect on quality of life from SDP activities and associated traffic movements including noise, vibration and emissions predominantly affecting areas around the dockyards and alongside localtransport networks. However, as the Devonport and Rosyth dockyards are operational dockyards and assuming that SDP activities would take place within the nuclear licensed site of the dockyards away from local populations, disturbance to local communities is expected to be minor and primarily related to transport movements to and from the dockyards (the movement of construction materials, general wastes, and LLW and ILW – refer to J. Material Assets (Transport)). However, no significant impacts are anticipated taking account of the estimated transport movements, which are unlikely to result in a discernable increase in traffic on the local road network,and may be reduced should equipment,materials and waste be transported by sea. The opportunity exists at both the Devonport and Rosyth dockyards to utilise existing rail and port facilities. Modifications to existing facilities and infrastructure and new build is required at both the Devonport and Rosyth dockyards to accommodate SDP activities. This could generate some local employment opportunities; although given the scale of potential development any employment generated is expected to be minor. Estimates of the number of jobs associated with construction and eventual decommissioning have not been available. The PW option is estimated to generate between 60-105 employment opportunities per year for the duration of the SDP (which is expected to take place over approximately 27 years). Initialdismantling (de-planting the RPV) is estimated to require 30-60 FTE. RPV segregation is estimated to require 20-30 FTE, with final packaging of ILW into GDF compliant packaging estimated to require a further 5-10 FTE. PW interim storage is estimated to require 5-10 FTEs. A number of these posts are expected to require specialist nuclear skills and expertise and in this respect the PW option would enable full advantage to be taken of existing SQEP, particularly those with practical knowledge gained from operating and conducting engineering work on the submarines to be decommissioned. As the Devonport and Rosyth dockyards are licensed and conduct similar activities to those required for some aspects of the SDP, it is likely that there would be a pre-existing local pool of appropriately skilled individuals. Consequently, there is a potential for economic benefits associated with SDP activities to be realised locally. Nonetheless, the extent to which local benefits would be realised depends on the recruitment policies of the MOD and contractors and unless clear contract direction was given to ensure that members of the local community were given preference, the employment opportunities created may not benefit the local community to any substantial extent. There may be potential to offer training opportunities associated with SDP activities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from the NAS. Any spend associated with SDP activities may lead to an increase in investment in local supply chains, fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. There may also be minor local economic benefits associated with employee spend (in terms of temporary accommodation, consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated. The extent to which SDP activities could benefit the local economy would depend on the requirements imposed by the MOD to

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				preferentially develop and use local supply chains as well as the contracting practices imposed by the lead contractor.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	Whilst SDP activities will incur costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net economic benefit in relation to national public expenditure. The level of development required (and employment opportunities created) at the Devonport and Rosyth dockyards is not of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing. There is considerable local public interest in the SDP and the use of the Devonport and Rosyth dockyards for SDP activities, with members of the public and local community expressing concern regarding the proposals, and as such it is anticipated that dismantling activities at the Devonport and Rosyth dockyards could be perceived negatively in the short term. However, it is not anticipated that dismantling activities would significantly alter perceptions of the attractiveness of the surrounding areas to existing and prospective residents and businesses once dismantling activities have begun, as the Devonport and Rosyth dockyards are operational dockyards and nuclear licensed sites, and the dismantling activities would be of a similar nature to existing activities taking place and consistent with the character of the existing dockyards. Notwithstanding this, there is the potential for effects in the long term, depending on how the storage of radioactive waste at the Devonport and Rosyth dockyards is perceived. On the one hand, as the facility is to be located within an existing nuclear licensed site this may be viewed as a continuation of existing use. On the other hand, some may perceive this as unfairly adding to licensed activities already taking place within a locality further undermining the attractiveness of the area to both current and prospective residents and businesses. Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. The potential impact on populations during construction for the PW option could therefore be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full early dismantling of the RPV and segregating the ILW and LLW prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on populations from SDP activities as levels of activity and disturbance would be greater. Notwithstanding this, in the case of the PW option early full dismantling of the RPV prior to interim storage would maximise any benefits associated with economies of scale. That being said, the extent to which these benefits would be locally significant would continue to depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices employed by the lead contractor. <u>Devonport Dockyard</u> Devonport dockyard is located adjacent to the Hamoaze estuary on the western fringe of the city of Plymouth. The Devonport dockyard is owned and operated by the Babcock Marine Division of Babcock International. The naval base provides full operational support to the Royal Navy's surface ships and submarines and also includes naval barracks. Devonport dockyard is also the UK's sole refitting and defuelling site for nuclear powered submarines. Devonport Yachts, who build large superyachts and luxury motor yachts, operate to the south of Devonport dockyard and are also part of Babcock Marine Division. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The Plymouth Navy Days event is also held at the Devonport Naval Base every two years for visitors to view the Royal Navy and foreign ships, which attracts up to 50,000 people. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	The Devonport ferry terminal for the Torpoint Ferry crossing is located to the south of the dockyard, which links the city of Plymouth to the town of Torpoint. International ferries to France and Spain route from Millbay Docks (located approximately 6km to the south-east of Devonport dockyard) across the Sound and into the English Channel. Private vessels moor along the Plymouth Sound, including in the Hamoaze to the west of Devonport dockyard. There are marinas at Sutton Harbour, Mount Wise in Hamoaze and at Turnchapel. Fishing vessels are understood to dock at Sutton Harbour. In 2001 the population of Devonport ward, in which Devonport dockyard is situated, was 14,287 people, with a population density of 37.5 people per hectare. The population of Devonport ward is predominantly of working age with 68.37% of the population aged 14-64 years (compared to 65.77% for Plymouth as a whole), 20.51% of the population aged 0-14 years (18.24% for Plymouth), and 11.12% of the population aged 65 years and over (15.98% for Plymouth). In 2010, Plymouth ranked 72 of 354 local authorities in England in the Indices of Multiple Deprivation. There are eight wards surrounding Devonport dockyard: Devonport, Ham, Stoke, St Budeaux, Saltash Essa, Rame, Torpoint East and Torpoint West. Within these wards, 64.80% of the population is aged 15-64 years, 20.01% is aged 0-14 years and 15.19% of the population is aged 65 years and over. An assessment of populations around Devonport dockyard has been calculated in an Outline Environmental Statement for the dockyard prepared to inform the SDP. This determined that there are 40,455 people within 2km of Devonport dockyard (from 9 Dock): of which 297 people are within 0-0.55km, 6,376 people are within 0.55-1km, and 33,782 people within 2km. At the time of reporting, the approximate number of service and non-service personnal working within the Naval Base boundaries was 12,658 people. There is the potential for SDP activities at Devonport dockyard to impact on local populations and visitors to the dockyard. However, as the Devonport dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site away from local populations, disturbance to local communities and businesses is expected to be minor and primarily related to transport movements to and from the dockyard, which, taking account of estimated transport movements and the timescales of the project are anticipated to have a negligible impact on the amenity of local residents along local transport routes from Devonport dockyard. <u>Rosyth Dockyard</u> Rosyth dockyard is located adjacent to the Firth of Forth estuary to the south-west of the town of Rosyth. The Rosyth dockyard is owned and operated by the Babcock Marine Division of Babcock International, and primarily undertakes refitting of Royal Navy surface vessels. Previously the Rosyth dockyard was also a refitting and defuelling site for nuclear powered submarines; however these operations ceased in 2003. It is understood that Rosyth dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. The Port of Rosyth, and the Rosyth Ferry Terminal is located just south-east of the Rosyth dockyard. The Ferry Terminal links Scotland directly to the Belgium mainland. In 2001, the population of Rosyth ward, in which Rosyth dockyard is situated, was 13,637 people. The population of Rosyth ward is predominantly of working age with 62.89% of the population aged 15-64 years (compared to 61.44% for Fife), 22.72% aged 0-14 years (19.64% for Fife), and 14.39% of the population aged 65 years and over (18.92% for Fife). There are four wards surrounding Rosyth dockyard: Rosyth, West Fife & Coastal Villages,

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				Inverkeithing & Dalgety Bay and Linlithgow. Within these wards, 66.93% of the population is aged 15-64 years, 20.13% is aged 0-14 years and 12.93% of the population is aged 65 years and over. In 2009, the area in which Rosyth dockyard is situated was in the 40%-50% most deprived data zones in Scotland, and parts of the town of Rosyth and neighbouring town of Inverkeithing was in the 10%-20% most deprived data zones.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	There is the potential for SDP activities at Rosyth dockyard to impact on local populations. However, as the Rosyth dockyard is an operational dockyard and assuming that SDP activities would take place within the dockyards away from local populations, disturbance to local communities and businesses is expected to be minor and primarily related to transport movements to and from the dockyards, which, taking account of estimated transport movements and the timescales of the project are anticipated to have a negligible impact on the amenity of local residents along transport routes. Traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Devonport dockyard is located in the city of Plymouth in a densely populated and built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. The ward in which Devonport dockyard is situated is more densely populated that that of Rosyth ward, but a greater percentage of the population is of working age. A greater percentage of the population in Rosyth ward are children and pensioners when compared to Devonport ward. In the wards adjacent to and surrounding Devonport dockyard however, a greater percentage of the population are children and pensioners when compared to Rosyth dockyard. Taking account of the location of the Devonport and Rosyth dockyards, surrounding land uses and transport routing to/from the dockyards, along with the scale of development required there is considered to be a greater potential for SDP activities at Devonport dockyard to affect local populations when compared to Rosyth dockyard, due to the proximity of the dockyard to densely populated residential areas, the requirement to route traffic through the outskirts of the city and the scale of development required. Rosyth dockyard is situated in a more isolated location with good transport links, and therefore fewer sensitive receptors could be affected. Notwithstanding this, any impact on the amenity of local residents as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be negligible. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Devonport dockyard to impact on the amenity of local populations associated with the transport of waste when compared to Rosyth dockyard. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any impact on local populations from LLW transportation is anticipated to be negligible. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. It is noted that utilising both sites would benefit two local economies.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/+	-/+	-/+	However, as submarine dismantling activities would be undertaken on two different sites (initial dismantling of the RPV taking place at one dockyard, and full segregation/size reduction of the RPV and interim storage of the PW taking place at the other dockyard), this combination option could result in a greater number of transport movements compared to Options 5D and 5R. Option 5B could therefore have a greater potential for impacts on local populations associated with transport when compared to Options 5D and 5R.

Option 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	- /?/+	- /?/+	- /?/+	As the Devonport and Rosyth dockyards are licensed and conduct similar activities to those required for some aspects of the SDP, it is likely that there would be a pre-existing local pool of appropriately skilled individuals. Consequently, there is a potential for employment benefits associated with dismantling, segregation and packaging activities to be realised locally. There could also be the potential for employment opportunities associated with interim storage to benefit local communities, depending on the availability of appropriately skilled individuals. Although the interim storage of PW is assumed to be a relatively passive activity with the PW remaining in-situ, with employment limited to a number of specialist staff to undertake monitoring activities. Nonetheless, the extent to which local benefits would be realised depends on the recruitment policies of the MOD and of contractors and unless clear contract direction was given to ensure that members of the local community and were given preference, the employment opportunities created may not benefit the local community to any substantial extent. There may be potential to offer training opportunities associated with SDP activities (e.g. apprenticeship schemes) for benefit of the local community. This would require collaboration with local training providers and support from the NAS. Any spend associated with SDP activities may lead to an increase in investment in local supply chains, fostering economic growth, generating indirect employment opportunities and enhancing the robustness of the local economy. There may also be minor local economic benefits associated with employee spend (in terms of temporary accommodation, consumables and entertainment). However, this is unlikely to be significant given the number of employment opportunities generated. The extent to which SDPactivities could benefit the local economy would depend on the requirements imposed by the MOD to preferentially develop and use local supply chains as well as the contracting practices imposed by the lead contractor. The level of development required (and employment opportunities created) at the Devonport and Rosyth dockyards is not expected to be of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing. Irrespective of the eventual location of the remote site, interim storage activities would alsonot be of sufficient scale to warrant investment in additional services or facilities for leisure, recreation, education, health, training and housing. There is considerable local public interest in the SDP and the use of the Devonport and Rosyth dockyards for SDP activities, with members of the public and local community expressing concern regarding the proposals, and as such it is anticipated that dismantling activities at the Devonport and Rosyth dockyards could be perceived negatively in the short term. However, it is not anticipated that dismantling activities would significantly alter perceptions of the attractiveness of the surrounding areas to existing and prospective residents and businesses once dismantling activities have begun, as the Devonport and Rosyth dockyards are operational dockyards and nuclear licensed sites, and the dismantling activities would be of a similar nature to existing activities taking place and consistent with the character of the existing dockyards. The potential for the interim storage of ILW to alter the perceptions of the attractiveness of area surrounding the remote site is at this stage unknown; however, this will depend on the location of the site for interim storage and the extent to which ILW storage (or equivalent) is already undertaken at the site. Whilst SDP activities will incur costs, over the long term this is expected to generate financial savings by reducing costs associated with current afloat storage such that there will be a net economic benefit in relation to nationalpublic expenditure.
B. Population Promote a strong,	-	-	-	Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. The potential impact on local

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	/?/+	/?/+	/?/+	populations during construction for the PW option could therefore be greater than the RPV option but less than the RC option. In the case of the PW option as it involves early full segregation and size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on populations from SDP activities as levels of activity would be greater. Notwithstanding this, completing construction in one phase would help to reduce the time period over which effects could occur. Undertaking SDP activities on different sites could also help to reduce disturbance levels and would benefit several local economies. Although the benefits of economies of scale may not be realised. <u>Devonport Dockyard</u> Devonport dockyard is located adjacent to the Hamoaze estuary on the western fringe of the city of Plymouth. The Devonport dockyard is owned and operated by the Babcock Marine Division of Babcock International. The naval base provides full operational support to the Royal Navy's surface ships and submarines and also includes naval barracks. Devonport dockyard is also the UK's sole refitting and defuelling site for nuclear powered submarines. Devonport Yachts, who build large superyachts and luxury motor yachts, operate to the south of the Devonport dockyard and are also part of the Babcock Marine Division. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The Plymouth Navy Days event is also held at the Devonport Naval Base every two years for visitors to view the Royal Navy and foreign ships, which attracts up to 50,000 people. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set open weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. The Devonport ferry terminal for the Torpoint Ferry crossing is located to the south of the dockyard, which links the city of Plymouth to the town of Torpoint. International ferries to France and Spain route from Millbay Docks (located approximately 6km to the south-east of Devonport dockyard) across the Sound and into the English Channel. Private vessels moor along the Plymouth Sound, including in the Hamoaze to the west of Devonport dockyard. There are marinas at Sutton Harbour, Mount Wise in Hamoaze and at Turnchapel. Fishing vessels are understood to dock at Sutton Harbour. In 2001 the population of Devonport ward, in which Devonport dockyard is situated, was 14,287 people, with a population density of 37.5 people per hectare. The population of Devonport ward is predominantly of working age with 68.37% of the population aged 14-64 years (compared to 65.77% for Plymouth as a whole), 20.51% of the population aged 0-14 years (18.24% for Plymouth), and 11.12% of the population aged 65 years and over (15.98% for Plymouth). In 2010, Plymouth ranked 72 of 354 local authorities in England in the Indices of Multiple Deprivation. There are eight wards surrounding Devonport dockyard: Devonport, Ham, Stoke, St Budeaux, Saltash Essa, Rame, Torpoint East and Torpoint West. Within these wards, 64.80% of the population is aged 15-64 years, 20.01% is aged 0-14 years and 15.19% of the population is aged 65 years and over. An assessment of populations around Devonport dockyard has been calculated in an Outline Environmental Statement for the dockyard prepared to inform the SDP. This determined that there are 40,455 people within 2km of Devonport dockyard (from 9 Dock): of which 297 people are within 0-0.55km, 6,376 people are within 0.55-1km, and 33,782 people within 2km. At the time of reporting, the approximate number of service and non-service personnal working within the Naval Base boundaries was 12,658 people.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise disturbance to local communities and maximise positive social impacts. *(continued)*	-/?/+	-/?/+	-/?/+	There is the potential for SDP activities at Devonport dockyard to impact on local populations and visitors to the dockyard. However, as the Devonport dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site away from local populations, disturbance to local communities and businesses is expected to be minor and primarily related to transport movements to and from the dockyard, which, taking account of estimated transport movements and the timescales of the project are anticipated to have a negligible impact on the amenity of local residents along local transport routes from Devonport dockyard. Rosyth Dockyard Rosyth dockyard is located adjacent to the Firth of Forth estuary to the south-west of the town of Rosyth. The Rosyth dockyard is owned and operated by the Babcock Marine Division of Babcock International, and primarily undertakes refitting of Royal Navy surface vessels. Previously the Rosyth dockyard was also a refitting and defuelling site for nuclear powered submarines; however these operations ceased in 2003. It is understood that Rosyth dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. The Port of Rosyth, and the Rosyth Ferry Terminal is located just south-east of the Rosyth dockyard. The Ferry Terminal links Scotland directly to the Belgium mainland. In 2001, the population of Rosyth ward, in which Rosyth dockyard is situated, was 13,637 people. The population of Rosyth ward is predominantly of working age with 62.89% of the population aged 15-64 years (compared to 61.44% for Fife), 22.72% aged 0-14 years (19.64% for Fife), and 14.39% of the population aged 65 years and over (18.92% for Fife). There are four wards surrounding Rosyth dockyard: Rosyth, West Fife & Coastal Villages, Inverkeithing & Dalgety Bay and Linlithgow. Within these wards, 66.93% of the population is aged 15-64 years, 20.13% is aged 0-14 years and 12.93% of the population is aged 65 years and over. In 2009, the area in which Rosyth dockyard is situated was in the 40%-50% most deprived data zones in Scotland, and parts of the town of Rosyth and neighbouring town of Inverkeithing was in the 10%-20% most deprived data zones. There is the potential for SDP activities at Rosyth dockyard to impact on local populations. However, as the Rosyth dockyard is an operational dockyard and assuming that SDP activities would take place within the dockyards away from local populations, disturbance to local communities and businesses is expected to be minor and primarily related to transport movements to and from the dockyards, which, taking account of estimated transport movements and the timescales of the project are anticipated to have a negligible impact on the amenity of local residents along transport routes. Traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 6/8D could therefore potentially have a greater impact on population associated with construction activities.
B. Population Promote a strong, diverse and stable economy with opportunities for all; minimise	-/?/+	-/?/+	-/?/+	Devonport dockyard is located in the city of Plymouth in a densely populated and built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. The ward in which Devonport dockyard is situated is more densely

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
disturbance to local communities and maximise positive social impacts. *(continued)*				populated that that of Rosyth ward, but a greater percentage of the population is of working age. A greater percentage of the population in Rosyth ward are children and pensioners when compared to Devonport ward. In the wards adjacent to and surrounding Devonport dockyard however, a greater percentage of the population are children and pensioners when compared to the wards surrounding Rosyth dockyard. Taking account of the location of the Devonport and Rosyth dockyards, surrounding land uses and transport routing to/from the dockyards, along with the scale of development required there is considered to be a greater potential for SDP activities at Devonport dockyard to affect local populations when compared to Rosyth dockyard, due to the proximity of the dockyard to densely populated residential areas, the requirement to route traffic through the outskirts of the city and the scale of development required. Rosyth dockyard is situated in a more isolated location with good transport links, and therefore fewer sensitive receptors could be affected. Notwithstanding this, any impact on the amenity of local residents as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be negligible. At this stage a remote site for interim storage has not been identified and subsequently the potential effect of these activities on populations is uncertain. The potential for effects would depend on the location of the remote site, the current range of ILW storage and segregation activities undertaken at the site, its proximity to local populations, the employment opportunities generated from interim storage activities, the local economy and employment market, and people's perceptions. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised for dismantling, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. It is noted that utilising three sites for dismantling would benefit several local economies, although economies of scale would be affected. However, as submarine dismantling activities would be undertaken on three different sites (initial dismantling of the RPV taking place at one dockyard, and full segregation of the RPV taking place at the other dockyard and interim storage of the PW at a remote site), this combination option could result in a greater number of transport movements compared to Options 6/8D and 6/8R. Option 6/8B could therefore have a greater potential for impacts on local populations associated with transport. Notwithstanding this, undertaking SDP activities on three different sites would reduce disturbance levels when compared to Options 6/8D and 6/8B which propose a greater level of activity at the dockyards.

A3. Human Health and Wellbeing

3.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on human health and wellbeing. Information is presented for both national and sub-regional levels.

There are links between the human health and wellbeing topic and other topics in the SEA, specifically human health (noise), air, climate change and energy use, material assets (transport) and material assets (waste management).

3.2 Summary of Plans and Programmes

3.2.1 International

The World Health Organization (WHO)[141] states that *"health promotion goes beyond health care. It puts health on the agenda of policy makers in all sectors and at all levels*; consequently, healthy public policy has been a main goal of health development in many countries. The ***Canadian Lalonde Report (1974)*** identified four health fields independently responsible for individual health: environment, human biology, lifestyle and health care organisation.

The WHO ***Children's Environment and Health Action Plan for Europe (CEHAPE) (2004)*** was launched in June 2004 and signed by all 53 Member States of the WHO European Region, including the UK. The aim of the CEHAPE is to protect the health of children and young people from environmental hazards.

The European Union has a Programme for Community action in the field of Health (2008-2013) and, on the 23/4R[d] October 2007 the Commission adopted a new overarching Health Strategy ***'Together for Health – A Strategic Approach for the EU 2008-2013'***. Community Action focuses on tackling health determinants which are categorized as: personal behaviour and lifestyles; influences within communities which can sustain or damage health; living and working conditions and access to health services; and general socio-economic, cultural and environmental conditions.

[141]See the Ottawa Charter adopted at the First International Conference on Health Promotion in 1986.

The ***SEA Directive*** adopted in 2001 specifically requires the consideration of "*the likely significant effects on the environment, including on issues such as …, human health, …*" (European Parliament and the Council of the European Union, 2001). The SEA Protocol (United Nations Economic Commission for Europe, 2003) implements the political commitments made at the Third European Conference on Environment and Health and uses the term 'environment and health' throughout. It indicates that health authorities should be consulted at the different stages of the process and so goes further than the SEA Directive. Once ratified, it will require changes to the SEA Directive to require that health authorities are statutory consultees.

The WHO publication ***Health Impact Assessment in Strategic Environmental Assessment (2001)*** provides a review of Health Impact Assessment concepts, methods and practice to support the development of a protocol on Strategic Environmental Assessment to the Espoo Convention, which adequately covers health impacts.

The International Commission on Radiological Protection (ICRP) produced the ***ICRP Publication 103 (2007)*** which provides recommendations and guidance on protection against the risks associated with ionising radiation, from naturally occurring or artificial sources including nuclear enterprises.

Publication 103: The 2007 Recommendations of the International Commission of Radiological Protection (2007) provides recommendations and guidance on protection against the risks associated with ionising radiation, from artificial sources used widely in medicine, general industry and nuclear enterprises, and from naturally occurring sources.

3.2.2 National

UK

Many of the national level policies and strategies regarding health are aimed at understanding the trends and nature of health issues within the country, understanding the links between health issues and other related factors (such as economic status, etc.), and, primarily, at reducing the inequalities in health outlooks that are evident between different parts of the country and different sections of the population. Whilst some applicable policies/strategies are contained within adopted strategies, many of the Government's objectives and intended actions are contained within White Papers and guidance papers.

The ***Health and Safety at Work etc Act (1974)*** placed general duties on all employers to protect the health and safety of their employees and those affected by their work activities. More recently the Health and Safety Commission publication ***A Strategy for Workplace Health and Safety in Great Britain to 2010 and beyond*** sets out the direction for the health and safety system and the roles of the Health and Safety Commission, the Health & Safety Executive and local authorities in Great Britain.

The Health Protection Agency's ***Children's Environment and Health Action Plan, a summary of current activities which address children's environment and health issues in the UK (2007)*** applies the objectives of CEHAPE (2004) to the UK context and ***A Children's Environment and Health Strategy for the United Kingdom (2009)*** provides recommendations from the Health Protection Agency to the UK Government as to how it best can meet its commitment to the CEHAPE.

The ***Ionising Radiations Regulations 1999 (IRR99)*** requires employers to keep exposure to ionising radiations 'As Low As Reasonably Practicable' (ALARP). and exposures must not exceed specified dose limits. Restriction of exposure should be achieved first by means of engineering control and design features. Where this is not reasonably practicable employers should introduce safe systems of work and only rely on the provision of personal protective equipment as a last resort. Any employer who undertakes work with ionising radiation must comply with IRR99.

Application of the 2007 Recommendations of the ICRP to the UK: Advice from the Health Protection Agency (2009) advises UK bodies with responsibility for protection against radiation on the application of the UK recommendations for radiological protection issued by the ICRP. The document provides background to the recommendations, addresses the biological basis for the recommendations, outlines the ICRP system of protection and advises on implementation.

The ***MOD Health and Safety Handbook*** and ***MOD Radiation Safety Handbook (2008)*** include the objective to minimise health risk (including levels of radiation) to their workforce, the public and the environment to As Low As Reasonably Practicable (ALARP). This is further supported by targets relating to reducing work related injury and illness within the ***MOD Sustainable Development Strategy (2008).***

England

In England, the Department of Health is the government department responsible for public health issues. Its work includes setting national standards, shaping the direction of health and social care services and promoting healthier living.

The NHS White Paper, ***Equity and excellence: Liberating the NHS (2010)*** sets out the Government's long-term vision for the future of the NHS and consists of three mutually-reinforcing parts:

- putting patients at the heart of the NHS;
- focusing on improving outcomes; and
- empowering local organisations and professionals.

Liberating the NHS: Legislative framework and next steps (**2010)** is the Government's response to the consultation on the implementation of the White Paper and three further consultations: ***Commissioning for patients (2010)*** **,** ***Local democratic legitimacy in health (2010)*** **and** ***Regulating healthcare providers (2010)*****.** In this document the Government's commitment to the White Paper reforms are reaffirmed and describes in detail how developments in light of the consultation will be put into practice across the three parts identified in the white paper above.

The ***Health and Social Care Bill (2011)*** takes forward the areas of Equity and Excellence: Liberating the NHS and the subsequent Government response Liberating the NHS: legislative framework and next steps (December 2010), which require primary legislation. However, following a review from the independent group NHS Future Forum the Bill is currently being reviewed in order to incorporate their recommendations.

Choosing Health, making healthy choices easier (2004), outlines the Government's broad approach to the improvement of public health in England. The themes of relevance involve the provision of information to the public on health, such as information on the effects of personal life choices and environmental circumstances that affect health, and the demand for access to health resources, including the provision of healthcare facilities along with facilities to maintain a healthy lifestyle. A summary on how to deliver the commitments on physical activity contained within this document, including promoting increased participation in physical activity across England are set out in ***Choosing Activity: a physical activity action plan (2005).***

The Department of Health White Paper ***'Our health, our care, our say', a new direction for community services (2006)*** explains in detail the improvements the Government is going to make to health and social care services, why the changes are necessary and the steps it is taking to make sure they happen. This document is supported by ***A stronger voice, a framework for creating a stronger local voice in the development of health and social care services (2006)***, which sets out the Government's plans for the future of patient and public involvement in health and social care.

Scotland

Scotland's Health White Paper, ***'Partnership for Care' (2003)*** sets out the Scottish Executive's policy on health. It is about the promotion of health in the broadest possible sense and the creation of a health service that is fit for the 21st Century. It sees patients and national standards as key drivers of change in the health service and frontline staff as leaders of the change process; it outlines ways in which the redesign, integration and quality of services can be systematically progressed and it seeks a step change in approach to health improvement as an essential complement to the modernised, patient focused services of the 21st Century.

Improving Health in Scotland – The Challenge (2003) provides a strategic framework to support the processes required to deliver a more rapid rate of health improvement in Scotland and highlights further actions to improve the health of the people of Scotland. It builds on the foundation of the previous framework, ***Towards a Healthier Scotland (1999)***. Increasing physical activity within Scotland is the objectives of Sport Scotland's ***A sport Scotland policy statement on sport and physical recreation in the outdoors (2009)*** and Scottish Executive Physical Activity Task Force's ***Strategy for physical activity (2003)***.

Wales

Planning Policy Wales (2010) states that planning policies and proposals should contribute to the protection and, where possible, the improvement of people's health and wellbeing. Consideration of the possible impacts of developments - positive and/or negative - on people's health at an early stage will help to clarify the relevance of health and the extent to which it needs to be taken into account.

Designed for Life (2005) sets out a series of 3 year strategic frameworks to work towards the Welsh Assembly Governments vision of the establishment of world class health and social care services in Wales in 2015.

Northern Ireland

Investing for Health (2002) is the public health strategy of the Northern Ireland Executive. It contains a framework for action to improve health and well-being and reduce health inequalities. The objectives are around the wider determinants of health, such as living and working conditions, the wider environment and healthy lifestyle choices.

The Department of Health, Social Services and Public Safety vision entitled; ***A Healthier Future: A Twenty Year Vision for Health and Wellbeing in Northern Ireland 2005 – 2025,*** focuses on tackling chronic diseases and the social and economic disadvantage that give rise to poor health. It plans to manage the majority of this in a community setting, in partnership with service users. Services will also focus on supporting, protecting and promoting the quality of life of those least able to protect themselves, including looked after children, vulnerable older people and people with disabilities or any other form of potential barrier to living a full life.

3.2.3 Sub-regional locations

Plymouth

Plymouth's ***Health, Social Care and Well-being Strategy 2008-2020*** is the guiding document that will inform and influence work across the partnership within Plymouth to improve health and well-being. It sets out a series of broad priorities to address the health, social care and well-being needs within Plymouth in the period 2008 to 2020. The Strategy includes the following objectives:

- to explicitly address health and well-being related inequalities in all plans through target setting, re-focusing investment and rigorous use of equality impact assessment;
- to shift the focus of investment to address prevention and health promotion, particularly in specified areas;
- mental health promotion;

- to directly address identified issues of access and take-up of specified services; and
- to further develop services to promote independence.

The ***Devon, Cornwall, Isles of Scilly Joint Emergency Response Protocol (2005)*** is the overarching protocol by which all emergencies (an event or situation which threatens serious damage to human welfare, the environment and security) are managed in the Devon, Cornwall and Isles of Scilly Local Resilience Forum Area and provides the underpinning principles for the development of all contingency plans.

Fife

Fife's Joint Health Improvement Plan, (JHIP) ***A Healthier Future for Fife (2007-2010)*** provides a strategic pathway for improving health and wellbeing in Fife over the plan period. The plan includes the following objectives:

- improve health and wellbeing across the whole population and over the whole of a person's life;
- reduce the gap in health between people living in different parts of Fife and between different groups of people within Fife - focusing on improving the health and wellbeing of individuals and groups who face the greatest health inequalities and barriers to inclusion;
- empower individuals and communities to make healthy choices;
- reduce the number of people who develop long-term conditions such as diabetes, stroke, coronary heart disease, cancer and respiratory disease - in order to ensure the people of Fife live longer and healthier lives; and
- continue to improve housing conditions, recognising the significant impact this can have on an individual's health.

In due course, the JHIP 2007-2010 will be replaced by Fife's third JHIP 2011-14, which Fife Health and Wellbeing Alliance are in the process of developing.

The ***Fife Major Emergency Plan (2010)*** produced by Fife Council sets out a management structure and defines emergency roles and call-out arrangements for responding to major emergencies in Fife. Fife's Emergency Planning Unit co-ordinates, advises and implements Fife Council's Integrated Emergency Management policy in response to any emergency that may require the mobilisation of Fife Council's staff or resources.

3.3 Overview of the Baseline

3.3.1 National

UK

In the UK, during 2006-2008, life expectancy at birth was 77.4 years for males and 81.6 years for females.[142]

In 2006-2008, 37% of males and 38% of females in the UK rated their health as good; 44% of males and 41% of females rated their health as very good. Consequently, around 19% to 21% of males and females in the UK felt that their health was less than good.[142]

In 2007 the main causes of death in the UK were diseases of the circulatory system, and neoplasms (cancers)[142] There are high levels of hypertension and overweight/obesity in the UK. Public health trends often correlate with deprivation and these figures for illness are invariably far less favourable in deprived areas. [143]

Deaths from respiratory diseases (including influenza, pneumonia, chronic lower respiratory disease, bronchitis, emphysema and other chronic obstructive pulmonary diseases and asthma) are higher in the UK than in any other EU Member State. In the UK there are 87.7 deaths per 100,000 males and 64.0 deaths per 100,000 females from respiratory diseases, compared to an EU average of 63.4 and 32.5.[144]

Public radiological dose limits (excluding natural background radiation and medical procedures) are:

- the sum of exposures should not exceed the dose limit of 1mSv per year;
- the dose received from any new source does not exceed 0.3mSv per year; and
- Exposures to members of the public from artificial sources remain at a very low level. Individual annual doses to members of the public from practices, other than medical procedures, are generally much less than the annual dose limit of 1 mSv.[143]

The average radiation dose (including natural background radiation and medical procedures) to the UK population is approximately 2.7 mSv/y (around 84% is due to natural sources, which varies in intensity as a function of underlying geology). Only 0.1% of the annual average dose is directly due to radioactive

[142] ONS, United Kingdom Health Statistics 2010, http://www.statistics.gov.uk/downloads/theme_health/ukhs4/ukhs4-2010.pdf

[143] Health Survey for England 2007 Healthy lifestyles: knowledge, attitudes and behaviour Summary of key findings, Office of National Statistics, http://www.statistics.gov.uk/StatBase/Product.asp?vlnk=6637

[144] ONS, United Kingdom Health Statistics 2010, http://www.statistics.gov.uk/downloads/theme_health/ukhs4/ukhs4-2010.pdf

discharges from nuclear and non nuclear sources. (The 2.7mSv is composed of: 0.33mSv natural Cosmic radiation; 0.35mSv natural Gamma radiation; 0.25mSv natural internal radiation; 1.3mSv natural Radon radiation; 0.41mSv artificial medical radiation; 0.006mSv artificial occupational radiation; 0.006mSv artificial fallout radiation from weapons testing in the past; 0.0009mSv artificial disposal radiation; and 0.0001mSv artificial consumer products radiation). [145]

The legal radiation dose limit set for workers is 20 mSv/y. [145]

In 2003 radiological discharge was assessed as being insignificant or extremely low at all main defence related sites. Exposures of less than 5μSv were received by all critical groups around all defence sites except Holy Loch (9μSv).

England

In England, during 2006-2008, life expectancy at birth was 77.93 years for males and 82.02 years for females.[146]

In 2006-2008, 38% of males and 39% of females in England rated their health as good; and 44% of males and 41% of females rated their health as very good.[146]

The latest Health Survey for England, published in 2010, includes the following key findings for 2009: [147]

- In 2009 men and women reported a similar prevalence of longstanding illness according to the Health Survey for England; 41 per cent of men, 43 per cent of women, and almost a quarter reported an illness limited their activity in some way; 22 per cent of men and 23 per cent of women;
- For adults aged 16 and over, self-reported cigarette smoking prevalence was 24 per cent for men and 20 per cent for women. Cigarette smoking prevalence varied by age, being higher among younger adults (32 per cent for men and 26 per cent for women aged 25-34) and lower among older adults (11 per cent for men and 8 per cent for women aged 75 and over);
- High blood pressure was 32% in men and 27% in women. The prevalence significantly increased with age in both sexes; and
- The percentage of adults who were obese has gradually increased over the period examined by the HSE, from 13 per cent of men in 1993 to 22 per cent in 2009 and from

[145] Health Protection Agency, Ionising Radiation Exposure of the UK Population: 2005 Review, http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1195733839711?p=1197637096018
[146] ONS, United Kingdom Health Statistics 2010, http://www.statistics.gov.uk/downloads/theme_health/ukhs4/ukhs4-2010.pdf
[147] Health Survey for England 2010, http://www.ic.nhs.uk/statistics-and-data-collections/health-and-lifestyles-related-surveys/health-survey-for-england/health-survey-for-england--2009-health-and-lifestyles

16 per cent of women in 1993 to 24 per cent in 2009.

Scotland

In Scotland, during 2006-2008, life expectancy at birth was 75.0 years for males and 79.9 years for females. [146]

In 2006-2008, 36% of males and 36% of females in Scotland rated their health as good; and 45% of males and 44% of females rated their health as very good. [146]

The latest Health Survey for Scotland, published in 2010, includes the following key findings for 2009:[148]

- 18.9% of men reported having CVD or diabetes;
- 15.2 % of men and 13.7 % of women reported having a cardiovascular condition;
- 26.9% of men and 27.6% of women in 2009 were considered obese (BMI >=30); and
- 31.0% of boys and 28.3% of girls have a BMI outside the healthy range (either underweight or overweight).

Wales

In Wales, in 2006-2008, life expectancy at birth was 76.9 years for Males and 81.2 years for females.[149]

In 2006-2008, 27% of males and 31% of females in Wales rated their health as good; and 50% of males and 46% of females rated their health as very good.[149.]

The latest Health Survey for Wales, published in 2010, includes the following key findings for 2009:[150]

- 20% of adults reported currently being treated for high blood pressure and 13% for a respiratory illness,
- 27% of adults reported having a limiting long-term illness.
- 24% of adults reported that they currently smoked.
- 57% of adults were classified as overweight or obese, including 21% obese.

[148] Scottish Health Survey (2010) http://www.scotland.gov.uk/News/Releases/2010/09/28083315
[149] ONS, United Kingdom Health Statistics 2010, http://www.statistics.gov.uk/downloads/theme_health/ukhs4/ukhs4-2010.pdf
[150] Welsh Health Survey (2010) http://wales.gov.uk/topics/statistics/headlines/health2010/100915/?lang=en

Northern Ireland

In Northern Ireland, in 2006-2008, life expectancy at birth was 76.3 years for males and 81.2 years for females.[151]

In 2006-2008, 37% of males and 37% of females in Northern Ireland rated their health as good; and 45% of males and 42% of females rated their health as very good.[151]

In 2005/06 within Northern Ireland the prevalence of overweight including obesity (BMI 25 or more) in men was 64.1% but was lower for women at 54.0%. [152]

3.3.2 Sub-regional locations

Plymouth

In Plymouth, during January 2007-December 2009, life expectancy at birth was 77.2 years for males and 82.0 years for females.[153]

Infant mortality in Plymouth is 4.5 per 1,000 live births, compared to 4.7 in England.[153]

Table 3.1 Number of diagnoses of diseases in Plymouth and England

Disease	Number of diagnoses in Plymouth in 2007-2008 [153]	Number of diagnoses in England in 2007-2008 [153]
Coronary heart disease	5,313	1,000,332
Cerebrovascular disease (including stroke)	999	187,962
Cancer (excluding non-melanoma skin cancer)	6,680	1,326,050

In 2001, 66.7% of people in Plymouth rated their health as good; 23.2% rated their health as fair; and 10.1% of people rated their health as not good. [153]

[151] ONS, United Kingdom Health Statistics 2010, http://www.statistics.gov.uk/downloads/theme_health/ukhs4/ukhs4-2010.pdf
[152] The Scottish Health Survey: Topic Report UK Comparisons http://www.scotland.gov.uk/Publications/2010/08/31093025/3
[153] ONS, Neighbourhood Statistics, http://www.neighbourhood.statistics.gov.uk/dissemination/LeadTableView.do?a=7&b=276837&c=plymouth&d=13&e=6&g=401185&i=1001x1003x1004&m=0&r=1&s=1298902555914&enc=1&dsFamilyId=937

Health in Plymouth has been improving over the last 10 years. By 2005, health (as measured by Standardised Mortality Rates) had almost improved to the level of the national average. Most deaths are caused by heart disease, stroke, and cancer; however rates are falling above the national average.[154]

Life expectancy in Plymouth is generally increasing; however, significant health inequalities exist. In the most deprived fifth of neighbourhoods, overall life expectancy was 75.3, compared to 78.7 for the city as a whole, and the gap has widened in recent years. In 2008, life expectancy in Devonport was nearly 13 years less than the best-performing ward.[155]

In 2007, Plymouth ranked 76th out of 354 Districts on the overall rank of deprivation (1 being the most deprived).

- 28.8% of area is within the 5th (most deprived) quintile of the Index of Multiple Deprivation (IMD) 2007;
- 25.1% of area is within the 4th quintile of the IMD 2007;
- 18.9% of area is within the 3th quintile of the IMD 2007;
- 19.6% of area is within the 2th quintile of the IMD 2007; and
- 7.6% of area is within the 1th (least deprived) quintile of the IMD 2007.[156]

Public Studies in 2004, 2006 and 2007 have consistently reported that Plymouth has higher cancer incidence than the national average. However, there is no geographic association of cancer with the Tamar, and no excess of cancers known to be radiation-sensitive. By contrast, there is an excess of cancers related to socio-economic deprivation, and to smoking in particular. Plymouth has been found to have cancer rates similar to other UK cities with a similar socio-economic profile.[157]

Fife

In Fife, in 2007-2009, life expectancy at birth was 76.1 years for males (compared to 75.4 years in Scotland) and 80.4 years for females (compared to 80.1 years in Scotland).[158]

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[154] Plymouth's Joint Strategic Needs Assessment updated February 2008 http://www.plymouthpct.nhs.uk/healthandwellbeing/publichealth/Pages/healthyplymouth.aspx
[155] Plymouth's Joint Strategic Needs Assessment updated February 2008 http://www.plymouthpct.nhs.uk/healthandwellbeing/publichealth/Pages/healthyplymouth.aspx
[156] Association of Public Health Authorities, Plymouth Health Profile 2009, http://informinghealthierchoices.net/resource/item.aspx?RID=71411
[157] Plymouth City Council, Cancer Incidence in Plymouth – 2007 follow-up report, http://www.plymouth.gov.uk/homepage/communityandliving/emergencies/regulatedhazardoussites/devonportdockyard.htm
[158] Life Expectancy for Administrative Areas within Scotland 2007 – 2009, General Register Office for Scotland; http://www.gro-scotland.gov.uk/files2/stats/life-expectancy-admin-areas/07-09/le-admin-areas-07-09.pdf

Table 3.2 Number of diagnoses of diseases in Fife and Scotland

Disease	Admissions rate/100,000 in Fife in 2008	Admissions rate/100,00 in Scotland in 2008
Coronary heart disease	554	556
Cerebrovascular disease	279	277
All cancer	3,178	2,729

All-cause mortality (all ages), and mortality rates from heart disease, stroke and cancer (under- 75s), are significantly better than, or not significantly different to, the Scotland average. [159]

In 2009, in Fife:

- 3.8% of the local area was in the 5% most health deprived data zones.
- 1.55% of deprivation measured data zones were in the 10% most health deprived data zones.
- 3.97% of deprivation measured data zones were in the 15% most health deprived data zones.
- 7.73% of deprivation measured data zones were in the 20% most health deprived data zones.[160]

Health in Fife is improving. Average life expectancy in Fife is above average; however there is a high degree of health inequality across Fife. In 2008 the total mortality rates per 100,000 head of population under 75 years old was 362.3. However, in the least deprived 20% of areas the rate was 230, whilst in the most deprived 20% of areas, the rate was 566. [161] In Fife, in 2005, the top three causes of death were: diseases of the circulatory system, neoplasms (tumours or abnormal growth of tissue) and diseases of the respiratory system. Fife had 57 General Practitioner (GP) practices in 2008 (1,397 patients per GP). [162]

Over one-third of people (35.6%) live within 500m of a derelict site (Scotland 27.3%). Compared to the

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159 Scotland Public Health Observatory, Health and Wellbeing Profile 2008, http://www.scotpho.org.uk/home/Comparativehealth/Profiles/chp_profiles.asp
160 Scottish Index of Multiple Deprivation 2009, http://www.scotland.gov.uk/Publications/2009/10/28104046/0
161 Scotland Public Health Observatory, Health and Wellbeing Profile 2008, http://www.scotpho.org.uk/home/Comparativehealth/Profiles/chp_profiles.asp
162 Fife Council, Know Fife, http://knowfife.fife.gov.uk

Scotland average of 15.0%, 10.3% of the population live in the 15% 'most access deprived' areas in Scotland.[161]

Health hazard to the general public from monitored levels of radionuclides in Fife is considered very small.[163]

3.4 Existing problems

3.4.1 National

UK

Health inequalities exist in many communities, often exacerbated by poor access to or use of health services. Any future funding constraints on health services are likely to affect this situation.

At present, respiratory illness places a significant burden on the health service which is partly attributable to existing air pollution. According to Occupational Health and Safety Information Service (2006), death rates from respiratory disease are higher in the UK than both the European and EU average. The report also suggests that respiratory disease costs the NHS and society £6.6 billion.

Health problems associated with radiological exposure are generally a minor issue in the UK; the great majority of the average public dose comes from natural sources of radiation, although testing and accidental releases do contribute to this. Background levels of natural radiation vary considerably from area to area, and any additional exposure (however small) may be an important issue for those communities who are already exposed to high natural background levels.

3.4.2 Sub-regional locations

Plymouth

Plymouth has an average life expectancy slightly below the UK average. Life expectancy in Plymouth is going up overall; however, some deprived areas have lower than average rates. Studies report that Plymouth has higher cancer rates than the national average and this is likely to be due to socio-economic deprivation and smoking rather than any other actives in the city.

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[163] Standing Conference of Local Authorities in the Forth Estuary, Radioactivity Monitoring April 2007 - March 2008, http://www.fife.gov.uk/publications/index.cfm?fuseaction=publication.pop&pubid=E9CB64D2-E118-36FC-E9DB07952A0CB3A2

Fife

Overall health in Fife is significantly better than, or not significantly different to, the Scotland average. However, there is a high degree of health inequality.

3.5 Likely evolution of the baseline

3.5.1 National

UK

Life expectancy at birth in the UK has reached its highest level on record for both males and females. A newborn baby boy could expect to live 77.7 years and a newborn baby girl 81.9 years if mortality rates remain the same as they were in 2007 - 2009. Females continue to live longer than males, but the gap has been closing.

Although both sexes have shown annual improvements in life expectancy at birth, over the past 27 years the gap has narrowed from 6.0 years to 4.2 years. Based on mortality rates in 1980 - 82, 26% of newborn males would die before age 65, but this had reduced to 15% based on 2007 - 2009 rates. The equivalent figures for newborn females were 16% in 1980 - 82 and 10% in 2007 - 2009. Life expectancy at age 65, the number of further years someone reaching 65 in 2007 - 2009 could expect to live, is also higher for women than for men. Based on 2007 - 2009 mortality rates, a man aged 65 could expect to live another 17.6 years, and a woman aged 65 another 20.2 years.

Within the UK, life expectancy varies by country, with the highest life expectancy at birth and at age 65 is higher for England than for the other countries of the UK. [164]

Health in the UK is improving, but over the last 10 years health inequalities between the social classes have widened.[165]

- National health targets include[166]:to reduce health inequalities by 10% in the three-year period 2009-2011, as measured by infant mortality and life expectancy at birth;
- by 2010, to reduce the death rate by cancer in people under 75 by at least a fifth;
- by 2010 to reduce the death rate by coronary heart disease and stroke in people under 75 by at least two fifths;

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[164] Office for National Statistics, http://www.statistics.gov.uk/cci/nugget.asp?id=168
[165] The Health Select Committee Report on Health Inequalities, May 2009, http://www.official-documents.gov.uk/document/cm76/7621/7621.pdf
[166] DoH, Saving Lives: Our Healthier Nation White Paper

- by 2010, to reduce the death rate due to accidents by at least a fifth and serious injury by at least a tenth;
- by 2010, to reduce the death rate from mental illness due to suicide and undetermined injury by at least a fifth
- Department of Health to reduce smoking in manual social groups, prevent and manage other risks for coronary heart disease and cancer especially targeting the over-50s and improve housing quality by tackling cold and dampness and reducing accidents
- National Health Service (NHS) to improve health as well as treating sickness; give patients more rights and control over their own health and care; ensure quality at the heart of the NHS; strengthen the involvement of clinicians in decision making at every level of the NHS; empower frontline staff to lead change that improves quality of care for patients; value the work of NHS staff. [167]

Between the 1970s and 2000 the Radiological dose to the UK population as a whole, presented as a per capita dose to a population of 55 million, did not changed significantly as it was dominated by the constant level of exposure to natural sources of radiation.[168]

Between 2001 and 2003 the average annual dose to the public was 2.7 mSv. This is a slight increase over that found in the previous Health Protection Agency review (where the average annual dose to the public was 2.6mSv (period 1992-1997)), mainly due to an increased contribution from medical irradiation. There has been a long-term trend towards lower occupational doses in the nuclear industry, and worker doses in medicine, general industry and research tend to be low.[169]

England

The current general trend in human health is generally towards improved health, greater life expectancy and reduced mortality from treatable conditions.[170]

For example, life expectancy for males in England increased from 76.9 years in 2003–05 to 78.3 years in 2007–09, an increase of 1.4 years. For females, life expectancy increased by 1.2 years from 81.1 to 82.3 years over the same period.[171] Trends in respiratory illness are downwards and are expected to continue like this, although a significant factor to be considered is that measured pollution is also

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[167] Darzi, High quality care for all: NHS Next Stage Review final report
[168] A L Jones et al 2007, Review of trends in the UK population dose, J. Radiol. Prot. 27 381-390 http://www.iop.org/EJ/abstract/0952-4746/27/4/R01
[169] Health Protection Agency, Ionising Radiation Exposure of the UK Population: 2005 Review, http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1195733839711?p=1197637096018
[170] Health Survey for England 2007 Healthy lifestyles: knowledge, attitudes and behaviour Summary of key findings, Office of National Statistics, http://www.statistics.gov.uk/StatBase/Product.asp?vlnk=6637
[171] ONS (2009) http://www.statistics.gov.uk/pdfdir/liex0611.pdf

affected by the weather, and hot summers in 2003 and 2006 significantly increased these levels.[172]

The key objectives of the Health and Social Care Bill (as it stood in mid June 2011) were:[173]

- to establish an independent NHS Board to allocate resources and provide commissioning guidance;
- to increase GPs' powers to commission services on behalf of their patients;
- to strengthen the role of the Care Quality Commission;
- to develop Monitor, the body that currently regulates NHS foundation trusts, into an economic regulator to oversee aspects of access and competition in the NHS; and
- to cut the number of health bodies to help meet the Government's commitment to cut NHS administration costs by a third, including abolishing Primary Care Trusts and Strategic Health Authorities.

Scotland

Male life expectancy has improved across Scotland as a whole (from 72.3 years during 1994-1998 to 73.9 years during 2001-2005). Female life expectancy has improved across Scotland as a whole (from 77.9 years during 1994-1998 to 79.1 years during 2001-2005). Alcohol related and attributable hospital patient rates have increased over time for Scotland as a whole, although rates are declining in some areas of Scotland. The number of people being admitted to hospital with heart disease has been declining over time in Scotland as a whole, and in most but not all Community Health Partnerships.[174]

In Scotland, the Health Improvement Targets for 2010-2011 include:

- through smoking cessation services, support 8% of local Board's smoking population in successfully quitting (at one month post quit) over the period 2008/9 - 2010/11;
- achieve agreed number of inequalities targeted cardiovascular Health Checks during 2010/11.

Wales

In Wales the under 75 age standardised mortality rate shows substantial variation across Wales. These differences from the Wales rate are statistically significant. The under 75 age-standardised mortality rate

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[172] Defra 2008
[173] http://services.parliament.uk/bills/2010-11/healthandsocialcare.html (accessed 20.06.2011)
[174] NHS Scotland, Health and Wellbeing Profiles 2008, Scotland Overview Report, http://www.scotpho.org.uk/nmsruntime/saveasdialog.asp?lID=4361&sID=3671

has fallen in all Local Health Board areas in Wales; overall it has declined by 18% between 1998 and 2007. This fall is likely to reflect not only the activities of health services, but also improvements in living standards in the latter part of the 20th Century. The greatest causes of death in people aged under 75 in Wales are cancer, circulatory disease and respiratory disease, together accounting for 40%, 27% and 9% of approximately 11,000 deaths in 2007. [175]

In Wales, the key strategy aims are:

- to ensure effective and timely treatment;
- to remove barriers to early treatment;
- to ensure the needs of older people are reflected in services and policy;
- to provide the most routine services quickly and easily locally while ensuring major operations are carried out with suitable professional support;
- to promote innovative solutions to addressing health inequalities; and
- to ensure funds follow the underlying needs for action to address health inequalities. [176]

Northern Ireland

In Northern Ireland between 1999-2001 and 2004-2006, male life expectancy at birth increased from 74.8 to 76.2 years (+1.4 years) and female life expectancy increased from 79.8 to 81.0 years (+1.3 years). A large proportion of the increase in life expectancy resulted from declining mortality due to coronary heart disease which led to an increase overall of 0.8 years for males and 0.5 years for females in life expectancy. However reducing mortality due to other types of circulatory disease, respiratory disease and cancer also increased life expectancy. Rising mortality over time due to accidental deaths, suicides, chronic liver disease and all ‘other’ causes of death reduced life expectancy by almost half a year for both males and females.[177]

The main public health targets for Northern Ireland include:

- to improve male and female life expectancy;
- to reduce the gap in life expectancy between wards; and
- to reduce the death rate for cancer, coronary heart disease, respiratory disease and

[175] NHS Wales, Wales and its Local Health Boards, http://www.wales.nhs.uk/sitesplus/documents/888/All%20Wales%20-%20Eng.pdf
[176] WAG, Wales: A Better Country, http://wales.gov.uk/docrepos/40382/dhss/strategies/walesabettercountry_-e.pdf?lang=en
[177] DHSSPS, NI Health and Social Care Inequalities Monitoring System Changes in the NI life expectancy gap 1999/01 to 2004/06, http://www.dhsspsni.gov.uk/2007_ineq_mon_update.pdf

stroke.[178]

3.5.2 Sub-regional locations

Plymouth

Life expectancy in Plymouth is going up overall. Patterns of illness in Plymouth are changing with an expected increase over the next 20 years of people in the community with common mental illnesses and disability. Such patterns will lead to increased dependence on care services, increased carer burden, increased worklessness due to incapacity and increased costs across all sectors.[179]

In Plymouth, the death rate per 100,000 resident population from circulatory disease (<75s) is decreasing in line with Neighbourhood Renewal Funding Local Area Agreement targets. In 2000 the circulatory disease mortality rate was 132.1 per 100,000 residents, reducing to 94.4 per 100,000 in 2005.[180]

The death rate per 100,000 resident population from cancers (<75s) is decreasing. In 2000, the cancer mortality rate was 138.9 per 100,000 residents, reducing to 122.5 per 100,000 in 2005. [180]

In Plymouth there is a trend of increasing health and increasing life expectancy. However:

- the prevalence of disability is set to increase over the next two decades compounded by an ageing population;
- there is a trend of increasing obesity in the younger population accompanied by an Increase in rates of type 2 diabetes; and
- the numbers of people quitting smoking is generally increasing, although the trend is not always true of the most deprived areas.[181]

The natural environment is a natural health service with the potential to make a major contribution to the mental and physical health and wellbeing of everyone in the South West. It is free for everyone to use and enjoy, enriches our knowledge, develops skills, supports cultural activities and is crucial for sustainable living.[182]

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[178] DHSSPS, a healthier future A Twenty Year Vision for Health and Wellbeing in Northern Ireland 2005 – 2025, http://www.dhsspsni.gov.uk/healthyfuture-main.pdf
[179] Plymouth's Joint Strategic Needs Assessment updated February 2008 http://www.plymouthpct.nhs.uk/healthandwellbeing/publichealth/Pages/healthyplymouth.aspx
[180] Plymouth's Sustainable Community Strategy 2007-2020, http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm
[181] Plymouth health Strategy 2008-2020, http://www.plymouthpct.nhs.uk/CorporateInformation/reportsandinquiries/Documents/Healthy%20Plymouth%20main%20web.pdf
[182] South West Regional Environment Network's Environmental Priorities 2010, http://www.swenvo.org.uk/swren/work/

Currently there are two government targets around smoking, one to reduce smoking overall from 28% to 24% by 2010 which nationally Plymouth is on course to meet, the other to reduce rates amongst manual groups from 32% to 26% by 2010, however Plymouth is not on target to meet this target, with levels in 2005 still around 31%.[183]

Effective planning and delivery for increased provision of, and appropriate access to, natural spaces can also inspire people to develop productive, healthy and socially just communities.[182]

Fife

The trend in Fife is that health is gradually improving. Between 1995 and 2004, death rates for the four main causes of death in Fife (cancer, heart disease, cerebrovascular disease and respiratory disease) decreased. Deaths from heart disease fell by 36%. Deaths from cerebrovascular disease and respiratory disease fell by 25%[184] and there is a trend of increasing life expectancy. [184] There is a trend of a slight increasing cancer registrations in the Fife population (from 503 per 100,000 in 2000-2004 to 515 per 100,000 in 2001-2005).

Between 2002 and 2008:

- cerebrovascular disease hospital admissions declined from 292 per 100,000 population to 279. (However there was a small increase in rates between 2006 and 2007; the trend is downwards, however the trend is not statistically significant).
- Between 2002 and 2008 cancer hospital admissions have increased from 2,842 per 100,000 population to 3.171.
- Between 2002 and 2008 respiratory disease hospital admissions have increased from 1,343 per 100,000 population to 1,473.

Between 2004 and 2009 the number of GP practices has remained relatively constant (57 in 2009).

Fife Council set the target to reduce the percentage of the adult population who smoke to 22% of adults by 2010.[185]

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[183] Plymouth's Health, Social Care and Well-being Strategy 2008-2020
[184] Fife Council, Single Outcome Agreement, 2009-2012, http://www.cvsfife.org/publications/draftsoa.pdf
[185] Fife Council, Single Outcome Agreement, 2009-2012 (draft), http://www.cvsfife.org/publications/draftsoa.pdf

3.6 Assessment objective, guide questions and significance

The objective and guide questions related to health that have been used in the assessment of the effects of the SDP are set out in Table 3.3, together with reasons for their selection.

Table 3.3 Approach to assessing the effects of SDP on Human Health and Wellbeing

Objective/guide question	Reasoning
Objective: to protect and enhance health safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.	The SEA Directive requires that likely significant effects on human health be taken into account in the Environmental Report.
Will the SDP Proposals affect the health or safety of SDP workers, or other people working at the proposed sites?	All employers have a general duty to protect the health and safety of their employees and those affected by their work activities, as set out in the Health and Safety at Work etc Act (1974). As SDP Proposals include a radioactive aspect it is also necessary to conform with the requirements of Ionising Radiation Regulations (1999) including to keep ionising radiations 'As Low As Reasonably Practicable' (ALARP) and that exposures must not exceed dose limits.
Will the SDP Proposals affect the health, safety and well-being of local communities?	There is a duty to protect the health of the local communities including more vulnerable members of the population, such as children as set out in CEHAPE (2004) and UK CEHAPE strategy (2007).
Will the SDP Proposals affect local healthcare infrastructure and provision?	Local healthcare infrastructure and provision will play a vital part in reaching local and national health targets such as addressing health inequalities and removing barriers to early treatment.

Table 3.4 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the health and wellbeing objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 3.4 Approach to determining the significance of effects on health and wellbeing

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option leads to cessation in radiation discharges which results in a sustained significant reduction in the effective dose to the public and workers from current levels. • Option supports the provision of healthcare facilities (i.e. as a result of an increase in the local population linked with employment provision). • Option has a strong and sustained positive effect on local communities and sensitive social groups adjacent to the sites and transport routes through improvements to environmental quality and/or a significant reduction in accident risk.

Effect	Description	Illustrative Guidance
+	Positive	• Option leads to a reduction in radiation discharges, so that the effective dose to the representative group that is most exposed decreases below current levels. • Option has a positive effect on local communities and sensitive social groups adjacent to the sites and transport routes through improvements to environmental quality and/ or a reduction in accident risk.
0	No (neutral effects)	• Option sees radiological discharges largely unchanged, such that there is no significant change to the effective dose to the representative group that is most exposed. • Option has no observable effects on local communities and sensitive social groups adjacent to the sites and transport routes.
-	Negative	• Option will increase the risk of SDP worker injury (e.g. as a result of trips, falls or accidents associated with the use of cutting equipment) although it will be possible to manage these risks through the adoption of standard health and safety procedures. • Option leads to an increase in worker dose compared to current but is less than the annual individual worker dose limit of 20 mSv per annum. • Option causes radiological discharges to increase, so that the effective dose to the representative group that is most exposed increases above current levels but remains within statutory limits. • Option results in some nuisance and/or disruption to the local community, such that some complaints could be expected
--	Significant negative	• Option significantly increases the risk of SDP worker injury (e.g. as a result of trips, falls or accidents associated with the use of cutting equipment) which cannot be mitigated through the adoption of standard health and safety procedures. • Option leads to a significant increase in worker dose compared to current and is equal to or greater than the annual individual worker dose limit of 20 mSv per annum. • Option causes radiological discharges to increase significantly, so that the effective dose to the representative group that is most exposed equals or exceeds the statutory limit of 0.5 mSv per year from a single site, and/ or 0.3 mSv per year from a single operational source (e.g. a single facility). • Option significantly increases the risk of accidental discharge of radiological contaminants. • Option gives rise to a significant risk of routine or accidental discharges of hazardous of non-radioactive materials (e.g. asbestos) affecting the health of SDP workers and the public. • Option causes statutory nuisance or a sustained and significant nuisance and/or disruption to the community for example, as a result of emissions from construction equipment or HGV movements.
?	Uncertain	• From the level of information available the impact that the option would have on this objective is uncertain.

3.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the health and wellbeing objective. **Table 3.5** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 3.5 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 3.6** below.

Table 3.6 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than

Category	Assumption Description
	'greenfield' sites, although it is recognised that 'brownfield' land can be important for conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m^2. Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2. As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average).

Category	Assumption Description
	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine • It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since recycling a cleared submarine is little different to recycling a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be

Category	Assumption Description
	transported from the initial dismantling facility to the interim storage facility by sea, rail or road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Box 3.6** are considered in-turn below.

Stage I: Design and Develop Initial Submarine Dismantling Facilities

Health and Wellbeing

Option 1: Develop a Greenfield Site for Initial Submarine Dismantling

Assessment of Effects:

The construction of initial dismantling facilities as part of the wider SDP process is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In moving submarines from a marine environment and ensuring their responsible handling and dismantling, it is considered that the long term residual environmental hazard posed will be reduced.

In constructing initial dismantling facilities and related infrastructure/ancillary facilities, it is assumed that all standard precautions will be taken to safeguard construction workers and the public such that activities will not result in any significant health and safety risks beyond those encountered on normal construction projects. That being said, there is potential for dust, noise and vibration associated with construction activities to have a short term, temporary effect on receptors in close proximity to the site. HGV movements required to transport materials to/from site may generate emissions and dust potentially affecting those with respiratory problems as well as noise and vibrations which may cause stress/anxiety to residents principally alongside local transport networks. In view of the scale of development proposed under this option, which is to include all infrastructure (e.g. roads) and ancillary facilities (e.g. administration offices, stores) required to support operational activities, it is considered that the magnitude of these effects will be greater than for Options 2 and 3. However, given the coastal location, it would be expected that much of the movement of construction material would be by sea which would serve to minimise any negative effects related to HGV movements.

There is also potential for negative effects to occur on community health as a result of accidental discharges of construction-related materials to water, air or land. However, it is considered that the probability of such effects occurring is low and adoption of pollution control management procedures within a comprehensive CEMP will help mitigate this risk.

Depending on the location of development, the nature of the greenfield site and the extent to which it is used for recreation and amenity, there is potential for the proposed development to have a subsequent indirect impact on community health in the long term, due to the loss of the site.

Construction of the facilities may be used as a focus for anti nuclear sentiment and may be subject to protest action from opposition groups and local communities. This could potentially increase the fear of crime through the fear of vandalism and personal injury as a result of an influx of a large number of people into a local area.

It is not expected that the proposed development under this option would incorporate the provision of new healthcare facilities/amenities and the number of permanent employment posts created to support construction activities would not be of sufficient scale to warrant investment in additional services or facilities.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations.

For RC and RPV options, the specialist facilities needed to package the ILW will not be needed until after interim storage. As the scale of construction would therefore be reduced, it can be assumed that emissions of dust/noise and vibration associated with construction activities and HGV movements (which may adversely affect receptors in close proximity to the site and alongside transport networks) will also be less relative to the Packaged Waste option (which would require construction of all dismantling facilities 'up front'). A reduction in the scale of construction activities is also expected to reduce the risk of construction worker injury (as the number of contractors will be reduced and the duration of works shortened) and the potential for accidental discharges of construction-related materials. However, under RC/RPV options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing development over two periods may serve to keep levels of disturbance below threshold levels (for example, air quality) where they may have a negative effect on the health and wellbeing of local communities.

Proposed Mitigation / Enhancements Measures:

- Seek to limit noise, dust and mobilisation of any contaminants during construction as part of Construction Environmental Management Plan (CEMP)
- Buildings, infrastructure and access roads should be sited as far as possible from site boundaries remote from potential sensitive receptors and any works that have the potential to have an effect on health and well-being (e.g. noisy and dust generating activities) should take place

Stage I: Design and Develop Initial Submarine Dismantling Facilities Health and Wellbeing	
within enclosed areas wherever possible. • Adopt HGV routing which seeks to avoid residential areas and existing Air Quality Management Areas. • Close consultation and full exchange of information with the local community, liaison with the local police and authorities, and the use of appropriate on-site security should minimise the risk of negative consequences of protest action, such as an increase in fear of crime. • The following hierarchal approach to addressing hazards should be followed where possible – eliminate hazards through design; where hazards cannot be designed out they should be isolated or protection to workers and the public should be provided; where the hazard cannot be avoided by protection or isolation, it's effects should be mitigated through design, process changes and management control measures. • Avoid the loss of open space/mitigate any loss through provision of replacement open space.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling this will lead to a reduction in the long term residual environmental hazard posed. Depending on the location and the proximity of local populations, there may be a negative effect on health and wellbeing from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). However, the scale of such potential disruption will depend on the extent to which construction material is moved to/from the site by sea (in preference to road or rail). There is potential for the construction of the facilities to be subject to protest action from opposition groups which may increase community unease and concern. Depending on the location of development, the nature of the greenfield site and the extent to which it is used for recreation and amenity, there is potential for the proposed development to have subsequent indirect impact on community health in the long term, due to the loss of the site. For RC and RPV options construction of the size reduction facility would be delayed. This may reduce negative effects associated with construction (e.g. emissions of dust/noise and vibration) in the short term relative to the Packaged Waste option (which would require construction of all dismantling facilities 'up front'). A reduction in the scale of construction activities is also expected to reduce the risk of construction worker injury and the potential for accidental discharges of construction-related materials. However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling to packaged waste.	**-**
Option 2: Develop a Brownfield Site for Initial Submarine Dismantling	
Assessment of Effects: The type of effects on the health and wellbeing of SDP workers and the local community identified in relation to the construction of initial dismantling facilities on a greenfield site (as described above) are expected to be similar for Option 2. However, as this option will not require construction of supporting infrastructure (e.g. roads), it is considered that there is potential for dust, noise and vibration associated with construction activities and HGV movements to be reduced relative to Option 1. A reduction in the scale of construction activities is also expected to reduce the risk of construction worker injury (as the number of contractors will be reduced and the duration of works shortened) and the potential for accidental discharges of construction-related materials. Depending on the location of development, the nature of the brownfield site and the extent to which it is used for recreation and amenity, there is potential for the proposed development to have subsequent indirect impacts on community health in the long term, due to the loss of the site. Whilst acknowledged as a potential effect, the likelihood of such an effect occurring is considered significantly less than for Option 1. There is potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to water, air or land. There is also the potential for the creation of new pollution pathways for existing contaminants on the site depending on the nature of the site selected. However, it is considered that the probability of such effects occurring is low and adoption of pollution control management	

Stage I: Design and Develop Initial Submarine Dismantling Facilities Health and Wellbeing	
procedures within a comprehensive CEMP will help mitigate this risk. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV options, the specialist facilities needed to package the ILW will not be needed until after interim storage. As the scale of construction would therefore be reduced, it can be assumed that emissions of dust/noise and vibration associated with construction activities and HGV movements (which may adversely affect receptors in close proximity to the site and alongside transport networks) will also be less relative to the Packaged Waste option (which would require construction of all dismantling facilities 'up front'). A reduction in the scale of construction activities is also expected to reduce the risk of construction worker injury (as the number of contractors will be reduced and the duration of works shortened) and the potential for accidental discharges of construction-related materials. However, under RC/RPV options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing development over two periods may serve to keep levels of disturbance below threshold levels (for example, air quality) where they may have a negative effect on the health and wellbeing of local communities. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Depending on the location and the proximity of local populations, there may be a negative effect on health and well being from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). However, the scale of such potential disruption is likely to be less than for Option 1 and effects will be partly mitigated through management procedures contained in the CEMP. There is potential for the construction of the facilities to be subject to protest action from opposition groups which may increase community unease and concern. For RC and RPV options construction of the size reduction facility would be delayed. This may reduce negative effects associated with construction (e.g. emissions of dust/noise and vibration) in the short term relative to the Packaged Waste option (which would require construction of all dismantling facilities 'up front'). A reduction in the scale of construction activities is also expected to reduce the risk of construction worker injury and the potential for accidental discharges of construction-related materials. However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling to packaged waste.	-
Option 3: Develop an Existing Licensed/Authorised Site for Initial Submarine Dismantling	
Assessment of Effects: The type of effects on the health and wellbeing of SDP workers and the local community identified in relation to the construction of initial dismantling facilities on greenfield or brownfield sites (as described above) are expected to be similar for Option 3. However, as Option 3 utilises existing sites Licensed/Authorised by the UK nuclear regulators it is expected that such sites would provide existing infrastructure (including roads, rail spurs and docks) and the majority of ancillary facilities (for example, administration offices and stores) capable of accommodating SDP facilities such that the scale of construction will be small relative to Options 1 and 2. Consequently, the magnitude of effects related to dust, noise and vibration associated with construction activities and HGV movements will be significantly reduced and, taking into account management procedures contained in the CEMP, should be adequately contained on site. A reduction in the scale of construction activities is also expected to reduce the risk of construction worker injury (as the number of contractors will be reduced and the duration of works	

Stage I: Design and Develop Initial Submarine Dismantling Facilities Health and Wellbeing	
shortened) and the potential for accidental discharges of construction-related materials It is also considered unlikely that development at an existing Licensed/Authorised site would result in the loss of land used for recreation and amenity such that the potential for indirect impacts on community health are limited. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV options, the specialist facilities needed to package the ILW will not be needed until after interim storage. As the scale of construction would therefore be reduced, it can be assumed that emissions of dust/noise and vibration associated with construction activities and HGV movements (which may adversely affect receptors in close proximity to the site and alongside transport networks) will also be less relative to the Packaged Waste option (which would require construction of all dismantling facilities 'up front'). A reduction in the scale of construction activities is also expected to reduce the risk of construction worker injury (as the number of contractors will be reduced and the duration of works shortened) and the potential for accidental discharges of construction-related materials. However, under RC/RPV options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing development over two periods may serve to keep levels of disturbance below threshold levels (for example, air quality) where they may have a negative effect on the health and wellbeing of local communities. **Proposed Mitigation / Enhancements Measures:** The following additional measure to those outlined under Option 1 has been identified: • Zone construction areas and move existing employees accordingly in order to reduce risk.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Depending on the location and the proximity of local populations, there may be a negative effect on health and well being from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). However, the scale of such potential disruption is likely to be minor and through management procedures contained in the CEMP, should be adequately contained on site. There is potential for the construction of the facilities to be subject to protest action from opposition groups which may increase community unease and concern. For RC and RPV options construction of the size reduction facility would be delayed. This may reduce negative effects associated with construction (e.g. emissions of dust/noise and vibration) in the short term relative to the Packaged Waste option (which would require construction of all dismantling facilities 'up front'). A reduction in the scale of construction activities is also expected to reduce the risk of construction worker injury and the potential for accidental discharges of construction-related materials. However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling to packaged waste.	**0**

Stage II: Design and Develop the Interim ILW Storage Facilities

Health and Wellbeing

Option 1: Develop a Greenfield Site for ILW Storage

Assessment of Effects:

Given the generic nature of the construction proposals for the interim storage facility, it assumed that the potential effects associated with this objective will be largely similar as for Stage 1.

The construction of an interim ILW storage facility as part of the wider SDP process is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In ensuring their responsible handling and dismantling, it is considered that the long term residual environmental hazard posed will be reduced.

In constructing an interim storage facility and related infrastructure, it is assumed that all standard precautions will be taken to safeguard construction workers and the public such that activities will not result in any significant health and safety risks beyond those encountered on normal construction projects. The most common cause of injury to workers is likely to be the result of handling, or slips and trips, reflecting national trends (as reported for 2009/10 by the Health and Safety Executive – see http://www.hse.gov.uk/statistics/industry/construction/index.htm [accessed 4th May 2011]) and as this option will require the construction of supporting infrastructure, it is expected that a greater number of workers will be required and the duration of works extended thereby increasing the potential for construction worker injury relative to Options 2 and 3.

There is potential for dust, noise and vibration associated with construction activities to have a short term, temporary effect on receptors in close proximity to the site. HGV movements required to transport materials to/from site may also generate emissions and dust potentially affecting those with respiratory problems as well as noise and vibrations affecting quality life of those residents principally alongside local transport networks. It is expected that the magnitude of these effects under this option will be greater than for Options 2 and 3 given the need to construct supporting infrastructure (e.g. roads) but will be influenced by the technical option taken forward (this is discussed below).

There is also potential for negative effects on health and wellbeing to occur as a result of accidental discharges of construction-related materials to water, air or land. However, it is considered that the probability of such effects occurring is low and adoption of pollution control management procedures within a comprehensive CEMP will help mitigate this risk.

Depending on the location of development, the nature of the greenfield site and the extent to which it is used for recreation and amenity, there is potential for the proposed development to have subsequent indirect impacts on community health in the long term, due to the loss of the site.

Construction of an interim storage facility may be used as a focus for anti nuclear sentiment and may be subject to protest action from opposition groups and local communities. This may potentially increase the fear of crime through the fear of vandalism and personal injury as a result of an influx of a large number of people into a local area.

It is not expected that the proposed development under this option would incorporate the provision of new healthcare facilities/amenities and the number of permanent employment posts created to support construction activities would not be of sufficient scale to warrant investment in additional services or facilities.

Technical Options:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

Storage of RCs will require construction of a relatively large facility. This reflects both the footprint of the facility and also the requirement for construction of supporting infrastructure. Consequently, it is assumed that this technical option would require a greater number of construction workers and that the duration of works would be longer which may increase the potential for construction worker injury. In view of the scale of works, it is also considered that emissions of dust and noise and vibration may be greater and would be felt over a longer duration thereby increasing the severity of effects on receptors in close proximity to the site.

Stage II: Design and Develop the Interim ILW Storage Facilities Health and Wellbeing	
Development over a larger area of greenfield land and the requirement for deep foundations to support RCs is expected to result in a greater number of HGV movements, particularly to transport materials and excavation arisings to/from site. Effects on the quality of life of residents alongside local transport networks may therefore be increased under this technical option although the coastal location of the facility could present an opportunity to transport construction materials by sea, reducing the number of HGV movements and associated adverse effects. **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. Ensuring their responsible handling and dismantling this will lead to a reduction in the long term residual environmental hazard posed. In constructing an interim ILW storage facility and related infrastructure, it is assumed that all standard precautions will be taken to safeguard construction workers and the public such that activities will not result in any significant health and safety risks beyond those encountered on normal construction projects. Depending on the location and the proximity of local populations, there may be a negative effect on health and wellbeing from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). The severity of these effects is dependent on the technical option taken forward and in this respect, RC storage will require construction of a relatively large facility including docking facilities which would increase the potential for adverse effects related to construction activities and HGV movements relative to the RPV and Packaged Waste options. There is potential for the construction of the facility to be subject to protest action from opposition groups which may increase community unease and concern. Depending on the location of development, the nature of the greenfield site and the extent to which it is used for recreation and amenity, there is potential for the proposed development to have subsequent indirect impact on community health in the long term, due to the loss of the site.	**0/-**
Option 2: Develop a Brownfield Site for ILW Storage	
Assessment of Effects: The type of effects on the health and wellbeing of SDP workers and the local community identified in relation to the construction of an interim ILW storage facility on a greenfield site (as described above) are expected to be similar for Option 2. However, as this option will not require construction of supporting infrastructure such as roads which would already be in place, the severity of these effects is expected to be reduced. Under this option there is potential for the creation of new pollution pathways for existing contaminants on the site depending on the nature of the site selected. However, it is considered that the probability of such effects is low and adoption of pollution control management procedures within a comprehensive CEMP will help mitigate this risk. Depending on the location of development, the nature of the brownfield site and the extent to which it is used for recreation and amenity, there is also potential for the proposed development to have subsequent indirect impacts on community health in the long term, due to the loss of the site. **Technical Options:** The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows: • RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).	

Stage II: Design and Develop the Interim ILW Storage Facilities Health and Wellbeing	
• RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above. • Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure. Storage of RCs will require construction of a relatively large facility. This reflects both the footprint of the facility and also the requirement for construction of supporting infrastructure. Consequently, it is assumed that this technical option would require a greater number of construction workers and that the duration of works would be longer which may increase the potential for construction worker injury. In view of the scale of works, it is also considered that emissions of dust and noise and vibration may be greater and would be felt over a longer duration thereby increasing the severity of effects on receptors in close proximity to the site. Development over a larger area and the requirement for deep foundations to support RCs is expected to result in a greater number of HGV movements, particularly to transport materials and excavation arisings to/from site. Effects on the quality of life of residents alongside local transport networks may therefore be increased under this technical option although the coastal location of the facility could present an opportunity to transport construction materials by sea, reducing the number of HGV movements and associated adverse effects. **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. Ensuring the responsible handling and dismantling of the redundant submarines will lead to a reduction in the long term residual environmental hazard posed. Depending on the location and the proximity of local populations, there may be a negative effect on health and wellbeing from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). However, in view of the likely scale of development and taking into account that effects will be partly mitigated through management procedures contained in the CEMP, it is considered that these effects will not be significant. That being said, RC storage will require construction of a relatively large facility which would increase the potential for adverse effects related to construction activities and HGV movements relative to RPV and Packaged Waste storage options however, it is considered that the scale of construction activity would still be relatively minor and so the effects would be unlikely to be significant. There is potential for the construction of the facilities to be subject to protest action from opposition groups which may increase community unease and concern.	**0**
Option 3: Develop an Existing Licensed/Authorised Site for ILW Storage	
Assessment of Effects: The type of effects on the health and well being of SDP workers and the local community identified in relation to the construction of an interim ILW storage facility on a brownfield site (as described above) are expected to be similar (or less) for Option 3 as it is assumed that a Licensed/Authorised site would comprise all supporting infrastructure and the majority of ancillary facilities. **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1. **Technical Options:** The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows: • RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities,	

Stage II: Design and Develop the Interim ILW Storage Facilities Health and Wellbeing	
inspection/maintenance facilities and office/admin areas). • RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above. • Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure. As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar.	
Summary: The type of effects on the health and well being of SDP workers and the local community identified in relation to the construction of an interim storage facility on a brownfield site (as described above) are expected to be similar (or less) for Option 3 as it is assumed that a Licensed/Authorised site would comprise all supporting infrastructure and the majority of ancillary facilities. The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling this will lead to a reduction in the long term residual environmental hazard posed. Depending on the location and the proximity of local populations, there may be a negative effect on health and wellbeing from construction activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from construction works and traffic). However, in view of the likely scale of development and taking into account that effects will be partly mitigated through management procedures contained in the CEMP, it is considered that these effects will not be significant. That being said, RC storage will require construction of a relatively large facility which would increase the potential for adverse effects related to construction activities and HGV movements relative to RPV and Packaged Waste options however, it is considered that the scale of construction activity would still be relatively minor and so the effects would be unlikely to be significant. There is potential for the construction of the facilities to be subject to protest action from opposition groups which may increase community unease and concern.	**0**

Stage III: Dock Submarines and Remove the Radioactive Materials

Health and Wellbeing

Option 1: Reactor Compartment Separation

Assessment of Effects:

Dismantling, as part of the wider SDP process, is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In moving submarines from a marine environment and ensuring the responsible handling and dismantling, it is considered that the long term residual environmental hazard posed will be reduced.

The estimates of the individual radioactive dose that workers would receive during RC separation (and subsequent dismantling to packaged ILW) have been assessed as being between 0.07 milliSieverts (mSv) and 0.12 mSv per year (depending on the number of workers employed). These estimates are between 0.35% and 0.6% of the annual worker dose limit of 20mSv per year. This represents the lowest radiation dose of all three technical options, which primarily reflects the fact that storing the RCs will maximize the amount of natural radioactive decay before the RPV is removed from the RC, minimizing worker doses when the RC is eventually dismantled. No effects on the public or other dockyard workers from planned activities would be expected, as the radiation would, by its very nature, be localised to within a few feet of the planned dismantling activities. Any planned discharges to air or water from the process are projected to remain well below statutory levels.

There is a risk of pollutants and/or radioactive materials being accidentally released into the initial dismantling site during an unplanned event, although as the radioactive materials themselves are largely steel components, they could not escape onto the wider environment (unlike, for example a gas or a liquid). The risk of such an unplanned release into the environment increases in proportion to the extent of dismantling, although strict legal controls are in place to prevent such events from occurring. Separating the RC is the least intrusive of the options and allows for further natural radioactive decay to take place prior to size reduction. As a result, the already very low risk of any accidental discharge or hazardous materials reaching the wider environment and hence the public would be the lowest of the three technical options.

Whilst radiological doses will be significantly below limits and the risk of accidental discharge is very low, it is recognised that this may not be the perception by the local communities. In this respect, anxiety relating to operational activity and in particular the radioactive waste element of site's operation may have a negative effect on the health and wellbeing of residents. Operational activity at the initial dismantling facility may also be used as a focus for anti nuclear sentiment and may be subject to protest action from opposition groups and local communities. This may potentially increase the fear of crime through the fear of vandalism and personal injury as a result of an influx of a large number of people into a local area.

Routine or accidental discharges of non-radioactive hazardous materials such as asbestos during the removal of submarine equipment or pipework may have a significant effect on the health of SDP workers. However, it is assumed that the likelihood of either routine discharges affecting the health of SDP workers or accidental discharges occurring will be reduced through the adoption of stringent health and safety standards and through Environmental Permitting regimes and application of Best Available Techniques (BAT) for dismantling.

The dismantling process also carries health and safety risks similar to those associated with standard ship recycling and may include, for example, trips, falls or accidents associated with the use of cutting equipment. These risks will be managed through standard health and safety procedures such that effects are not expected to be significant.

Operational activity may result in increased noise and vibration which could have a negative effect on the health and well being of the local community predominantly in areas around the initial dismantling facility. Causes of noise and vibration may include the use of cutting equipment during hot work to create RC pressure hull cuts and HGV movements required to transport materials, equipment and waste to/from the site. These effects may also be felt in the longer term during RC dismantling to packaged waste and are considered as part of the assessment of this option under Stage 6.

HGV movements and the use of cutting and other equipment may also result in increased emissions to air, potentially affecting those with respiratory problems alongside local transport networks and in close proximity to the site. These effects may be significant in areas where there are existing quality of life issues. These areas are more likely to be urban locations and may include, for example, Air Quality Management Areas (AQMAs). However, the effects on this aspect of the objective are deemed to be uncertain until the location of a dismantling facility is identified.

Proposed Mitigation / Enhancements Measures:

- Adopt HGV routing which seeks to avoid residential areas and existing Air Quality Management Areas.

Stage III: Dock Submarines and Remove the Radioactive Materials

Health and Wellbeing

- Close consultation and full exchange of information with the local community, liaison with the local police and authorities, and the use of appropriate on-site security should minimise the risk of negative consequences of protest action, such as an increase in fear of crime.
- Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act
- All available transport options should be subject to environmental assessment to determine their effect.
- Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency.
- Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators.
- Engage the public on a continual basis in order to seek to reduce anxiety relating to radiological discharge. Options for engagement may include regular reporting of discharges via a dedicated website/press releases, creation of a community forum and/or regular attendance by SDP representatives at existing community meetings and development of educational opportunities.

Summary:	
The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Public or other dockyard workers would not be expected to receive any radioactive dose from planned activities and worker radiological doses are expected to be below dose limits. Whilst there is a risk of accidental discharge, the probability of such a risk occurring is considered to be very low. However, it is recognised that there could be anxiety relating to operational activity and in particular the radioactive waste element of site's operation that may have a negative effect on the health and wellbeing of residents and there is also potential for operations to be subject to protest action from opposition groups which may increase community unease and concern. However, this is dependent on how the operations are perceived. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from operational activities (e.g. noise and emissions associated with the use of equipment and traffic movements). However, this is dependent on the location of the dismantling facility and the proximity of sensitive receptors.	**-/+**

Option 2: Reactor Pressure Vessel Removal

Assessment of Effects:

Both the type and severity of effects on the health and wellbeing of the local community and SDP workers identified in relation to the RC option (as described above) are expected to be similar for Option 2. Individual worker dose exposure estimates from RPV removal (and subsequent size reduction to packaged ILW) are estimated to be between 0.47 mSv and 0.85 mSv per year, depending on the number of workers employed. These estimates are 2.35% and 4.25% of the annual worker dose limit, and are higher than for RC separation, reflecting the fact that RPV removal is a more dose intensive activity. Storing the RPVs will, however, allow natural radioactive decay over time, minimising worker doses when they are eventually dismantled to packaged waste. Once again, no adverse effects on the public or other dockyard workers from the planned activities would be expected.

The potential for accidental release of pollutants and radioactive materials into the environment during initial dismantling could in theory be slightly higher than Option 1, as this option involves cutting into the RC, handling the RPV and segregating the LLW. However, this risk will have to be kept as low as reasonably practicable by law, in order for work to proceed. There may also be additional risks associated with the movement of LLW to the LLWR and hazardous waste for example, as a result of fire or collision. However, these activities will be closely regulated and subject to stringent health and safety standards which is expected to reduce the risk of such accidental discharges such that the probability of accidental discharge occurring is considered to be very low. As context, it is noted that in 2009, the UK had half a million movements of packaged waste and whilst there were 32 incidents, none of them resulted in significant radiation doses to workers or members

Stage III: Dock Submarines and Remove the Radioactive Materials

Health and Wellbeing

of the public.

It is assumed that the transportation of LLW would be via road and consequently, there may be associated non-radiological negative effects related to HGV movements beyond those connected to the movement of materials, equipment and non-radioactive waste. These effects may include noise, vibration and emissions to air which could affect those with respiratory problems alongside local transport networks both in the vicinity of the initial dismantling facility and at the LLWR. However, it is assumed that the number of LLW movements per annum would be minor. The severity of these effects is dependent upon the location of the initial dismantling facility, HGV routing and the proximity of sensitive receptors and are consequently deemed to be uncertain until the location of a dismantling facility is identified. There may also be an opportunity to transport LLW by rail or, given the coastal location, sea which could reduce these effects. Under this option the extent of operational activities would be intensified such that the level and duration of noise, vibration and emissions caused by the operation of equipment may also increase relative to Option 1. However, the extent of external submarine hull cutting required under this option would be less and consequently it is considered more likely that noise, vibration and emissions associated with the use of cutting equipment would be reduced.

Proposed Mitigation / Enhancements Measures:

- No additional mitigation measures proposed above those set out for Option 1.

Summary:	
The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Public or other dockyard workers would not be expected to receive any radioactive dose from planned activities and worker radiological doses are expected to be below dose limits. Whilst there is a risk of accidental discharge (which may be heightened relative to Option 1 given the need for intrusive activities in the reactor plant, handling of the RPV and requirement to transport LLW), the probability of such a risk occurring is considered to be very low. However, it is recognised that there could be anxiety relating to operational activity and in particular the radioactive waste element of site's operation that may have a negative effect on the health and well-being of residents and there is also potential for operations to be subject to protest action from opposition groups which may increase community unease and concern. However, this is dependent on how the operations are perceived. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from operational activities (e.g. noise and emissions associated with the use of equipment) and associated traffic movements. However, this is dependent on the location of the dismantling facility and the proximity of sensitive receptors. This option will also generate some limited quantities of LLW that will require transport to the LLWR. There may be noise, vibrations and exhaust emissions arising from the associated HGV movements; however, the number of such movements would be small such that the effects would not be significant.	**-/+**

Option 3: Reactor Pressure Vessel Removal and Size Reduction for Storage as Packaged Waste

Assessment of Effects:

Both the type and severity of effects on the health and wellbeing of the local community and SDP workers identified in relation to Option 2 (as described above) are expected to be similar for the Packaged Waste option. The expected individual radiological doses to workers from planned activities are estimated to be between 0.5mSv and 0.9mSv per year (depending on the number of workers employed). These estimates are 2.5% and 4.5% of the annual worker dose limit. This is similar to the RPV option reflecting the fact that, whilst this option would not benefit from natural dose reduction, RPV removal is a dose intensive activity. Statutory requirements to minimise occupational dose dictate that subsequent size reduction would be carried out using remote handling technologies in shielded facilities known as 'hot cells'. Once again, no adverse effects on the public or other dockyard workers from the planned activities would be expected.

The potential for an accidental release of pollutants and radioactive materials into the environment is in theory the highest of the three options, as the RPV itself would be taken apart and packaged 'up front'. However, this risk would again have to remain very low in order for work to proceed. There may also be additional risks associated with the movement of LLW to the LLWR and hazardous waste for example, as a result of fire or collision. However, these activities will be closely regulated and subject to stringent health and safety standards which is expected to

Stage III: Dock Submarines and Remove the Radioactive Materials **Health and Wellbeing**	
reduce the risk of such accidental discharges such that the probability of accidental discharge occurring is considered to be very low. The transportation of all LLW from the initial dismantling facility is expected to generate a greater number of HGV movements in the medium term relative to Options 1 and 2. This may increase non-radiological negative effects related to HGV movements including noise, vibration and emissions to air that could affect those with respiratory problems alongside local transport networks both in the vicinity of the dismantling facility and at the Repository. However, it is expected that the number of LLW movement per annum would still be small although the severity of these effects is dependent upon the location of the dismantling facility, HGV routing and the proximity of sensitive receptors. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Public or other dockyard workers would not be expected to receive any radioactive dose from planned activities and worker radiological doses are expected to be below dose limits. There is a risk of accidental discharge associated with dismantling the RC to Packaged Waste and requirement to transport the resulting LLW. However, the probability of such a risk occurring is considered to be very low in view of the extent of regulatory control and adoption of stringent health and safety measures. It is recognised that there could be anxiety relating to operational activity and in particular the radioactive waste element of site's operation which may have a negative effect on the health and well-being of residents and there is also potential for operations to be subject to protest action from opposition groups which may increase community unease and concern. However, this is dependent on how the operations are perceived. Depending on the location and the proximity of local populations, there may be a negative effect on quality of life from operational activities (e.g. noise and emissions associated with the use of equipment) and associated traffic movements. However, this is dependent on the location of the initial dismantling facility and the proximity of sensitive receptors. This option will also generate LLW which will require transport to the LLWR. There may be noise, vibrations and exhaust emissions arising from the associated HGV movements; however, the number of such movements would be small such that the effects would not be significant.	**-/+**

Stage IV: Dismantle the Residual Submarine Hulls, and Process Wastes

Health and Wellbeing

All Options

Assessment of Effects:

Recycling, as part of the wider SDP process, is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In moving submarines from a marine environment and ensuring their responsible handling and dismantling, it is considered that the long term residual environmental hazard posed will be reduced.

Recycling of submarines will involve prior removal of some components at the initial dismantling facility including, for example, internal systems and insulating materials that may contain hazardous waste such as asbestos, especially within old vessels. Hulls will also be shot blasted to remove paint and protective coatings which could release hazardous contaminants such as zinc phosphate, trimite and tanclene. Exposure of such hazardous materials and waste to SDP workers (as a result of either routine or accidental discharge) may have a significant negative effect on their health. However, it is assumed that the likelihood of routine discharges affecting the health of SDP workers or accidental discharges occurring will be reduced through the adoption of stringent health and safety standards and Environmental Permitting regimes, application of BAT for dismantling and the undertaking of surveys to determine the presence and quantities of hazardous materials prior to the commencement of works. Works undertaken at the ship recycling facility will involve the removal of large equipment including steam plant, pumps, diesel generators and chemical dosing systems as well as some insulating materials which are expected to contain potentially hazardous substances such as asbestos. Paint removal would also be undertaken which could release hazardous contaminants similar to those associated with preparation activities described above. However, the recycling facility will be subject to regulatory requirements such that the risk of any breach to these standards (and, therefore, any negative effects on health and wellbeing caused by exposure to workers) is considered to be minimal.

The recycling process also carries health and safety risks similar to those associated with standard ship recycling and may include, for example, trips, falls or accidents related to the use of cutting equipment. These risks will be managed through standard health and safety procedures and management controls such that effects are not expected to be significant.

It is anticipated that any routine discharges of hazardous contaminants will be contained within the initial dismantling and ship recycling facilities and consequently there is not expected to be any effects on the health and wellbeing of local communities as a result of dismantling activities during this stage of the SDP process. However, there is a risk of an unplanned incident (e.g. major fire) that could release contaminants to air and result in a significant negative effect on the health of the public. However, the probability of such an event occurring is extremely low.

Preparatory works undertaken at the initial dismantling facility may result in increased noise and vibration for example, as a result of the use of cutting equipment during stripping. However, the nature of the works is such that emissions are expected to be contained within the site whilst any activities would need to adhere to best practice set out in BS 5228:2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites) and therefore potential negative effects on the health and wellbeing of local communities are expected to be negligible. Emissions of noise and vibration associated with the break up of submarine hulls and removal of large equipment are expected to be greater than those related to preparatory work given the extent of cutting required. However, it is considered that generation of noise from the works will not be greater than those associated with the existing operation of the ship recycling facility.

There is potential for HGV movements associated with the works to generate noise, vibration and emissions that may affect the health and well being of residents alongside local transport networks. These effects may be significant in areas where quality of life issues exist. However, the effects on this aspect of the objective are deemed to be uncertain until the location of the dismantling and recycling facilities have been identified.

Proposed Mitigation / Enhancements Measures:

- Any health and safety risks arising from operational activities should be reduced by making use of BAT.
- Work involving hazardous materials will be undertaken in accordance with the Control of Substances Hazardous to Health Regulations 2002 (as amended). Work involving asbestos will be carried out in accordance with the Control of Asbestos Regulations 2006.
- The ship recycling facility selected to undertake the work should demonstrate high environmental and health and safety performance.
- Adopt HGV routing that seeks to avoid residential areas and existing AQMAs.

Stage IV: Dismantle the Residual Submarine Hulls, and Process Wastes Health and Wellbeing	
• Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act • Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency. • Where possible, the use of mains electricity to power equipment would be preferential to diesel or petrol powered generators.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Preparatory and recycling activities are expected to generate hazardous waste and may mobilise potentially harmful substances (e.g. as a result of the removal of insulating materials) the routine or accidental discharge of which could have a significant negative effect on the health and wellbeing of SDP workers and ship recycling facility employees. However, negative effects are expected to be mitigated through the adoption of stringent health and safety standards and Environmental Permitting regimes, application of BAT for dismantling and the undertaking of surveys to determine the presence and quantities of hazardous materials prior to the commencement of works. The recycling process also carries health and safety risks similar to those associated with standard ship recycling although these risks will be managed through standard health and safety procedures and management controls such that effects are not expected to be significant. It is anticipated that any routine discharges of hazardous contaminants will be contained within the initial dismantling and ship recycling facilities and there is not expected to be any effects on the health and wellbeing of local communities. However, there is a risk of an unplanned incident (e.g. major fire) which could release contaminants to air and result in a significant negative effect on the health of the public. However, the probability of such an event occurring is extremely low. Depending on the location and the proximity of local populations, there may be a negative effect on the health and wellbeing of local communities from operational activities (e.g. noise and emissions associated with the use of plant equipment). However, it is expected that these emissions will be contained within the site. HGV movements may generate noise, vibration and emissions which could affect the health and wellbeing of residents alongside local transport networks, although the severity of these effects is uncertain until the location of the dismantling and recycling facilities have been identified.	**0**

Stage V: Transport the RC/RPV/ILW to Interim Storage

Health and Wellbeing

Option 1: : Reactor Compartment Transport to Interim Storage

Assessment of Effects:

The transportation and storage of RCs, as part of the wider SDP process, is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In moving submarines from a marine environment and ensuring their responsible handling and dismantling, it is considered that the long term residual environmental hazard posed will be reduced.

Maintenance and inspection of RCs during the interim storage period is not considered to contribute significantly to the worker dose identified under Stage 3 for this option (which is below dose limits). It is not anticipated that doses for this (or any other) option would come close to exceeding public radiological dose limits (excluding natural background radiation and medical procedures) either alone or in combination with other activities (should the initial dismantling facility be located within an Existing Licensed/Authorised site). The transportation of RCs would also be strictly regulated such that public dose would not exceed limits set out in the Transport Regulations and approvals for transportation will only be given once the regulator is satisfied that the possibility for incidents and accidents has been minimised and that the radiological content can be effectively contained if that were to occur. In this respect, RCs will be sealed prior to movement (in accordance with the Transport Regulations) and made passively safe (i.e. all liquids and potentially mobile radioactive materials would be removed or immobilised) and as such it is not expected that there will be any routine or accidental discharge of radiological contaminants during transportation. As context, up to half a million packages containing radioactive materials are transported to, from and within the UK every year, by rail, road, sea and air. During 2009, 32 accidents and incidents occurred none of which resulted in any significant external or internal radiation doses to workers or members of the public (as reported in Harvey, 2010, Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Material in the UK - 2009 Review).

During RC storage, the risk of accidental discharge of radiological contaminants is also considered to be extremely low as the integrity of RCs will be regularly inspected and maintained to ensure that RCs remain passively safe. There remains a risk of an unplanned incident such as a major fire at the interim storage facility resulting in the mobilisation and release of radiological contaminants. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low.

The transportation and storage of RCs carries health and safety risks similar to those associated with common industrial operations and may include, for example, accidents associated with the use of welding equipment during preparation for transport, movement and lift of the RC from the dockside to the barge, unloading and transfer of the RC to the interim store and any store maintenance (particularly where working at height may occur). These risks will be managed through standard health and safety procedures such that effects are not expected to be significant.

Whilst radiological doses will be below limits and the risk of accidental discharge is low during this stage of the SDP process, it is recognised that this may not be the perception. Similar to dismantling activities (see Stages 3 and 6), transportation and storage of RCs may cause anxiety among the public particularly in the vicinity of the dismantling and storage facilities.

The loading and unloading of RCs and subsequent maintenance activities during storage (e.g. should works be required to reinforce RC shielding) will generate some noise and vibration although this is expected to be predominantly contained within the site such that activities are unlikely to result in any stress to local communities. Emissions to air (e.g. (e.g. associated with the use of heavy lifting equipment), which could potentially affect those with respiratory problems in close proximity to SDP sites, are also expected to be minimal given both the frequency of RC movements and the extent of works required to maintain and inspect RCs once in storage. HGV movements required for the transportation of any additional equipment, materials or waste to/from the storage facility may generate noise, vibration and emissions which could have negative effects alongside transport networks. The frequency and number of such movements however is expected to be very small and not discernible against a backdrop of existing traffic such that any effects on the health and wellbeing of local communities are unlikely to be significant.

Proposed Mitigation / Enhancements Measures:

- As the type of effects identified in relation to this option are similar to those under Stage 3, the proposed mitigation and enhancement measures are also considered to be same.

Stage V: Transport the RC/RPV/ILW to Interim Storage Health and Wellbeing	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Public or other dockyard workers would not be expected to receive any radioactive dose from planned activities and worker radiological doses associated with the transportation and storage of RCs are expected to be significantly below dose limits. Whilst there is a risk of accidental discharge, the probability of such an event occurring is considered to be very low. However, it is recognised that there may be anxiety relating in particular to the storage of RCs which could have a negative effect on the health and well-being of residents in the vicinity of the interim storage facility although this is dependent on how the facility is perceived.	**0**
Option 2: Reactor Pressure Vessel Transport to Interim Storage	
Assessment of Effects: The range and significance of potential effects on the health and wellbeing of SDP workers and the local community identified in relation to RC transportation and storage (as described above) are expected to be similar for Option 2. Worker and public radiological doses are expected to be significantly below limits (see Stage 3 for further information). The RPVs would be sealed, packaged and regularly inspected such that the radiological risks from a breach of the RPV during loading/unloading, transportation and interim storage will be similar to that associated with Option 1. It is also anticipated that any liquids and sludge will have been removed from the RPV during RPV removal (Stage 3) and therefore the consequence of any radiological discharges from a breach affecting the health and wellbeing of workers and the public would be minimal. There remains a risk of an unplanned incident during RPV transportation or at the interim storage facility which could have a significant negative effect on the health and wellbeing of workers and the public. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. RPVs may be transported by road, rail or sea. Should the RPV be transported by road, the use of a wide/abnormal load vehicle and security escort would be required generating noise and vibration which could cause stress or anxiety to local communities alongside transport corridors. However, any effects would be temporary, occur once a year and geographically restricted (as RPVs are unlikely to be moved over significant distances due to their size and weight). **Proposed Mitigation / Enhancements Measures:** • As the type of effects identified in relation to this option are similar to those under Stage 3, the proposed mitigation and enhancement measures are also considered to be same.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Public or other dockyard workers would not be expected to receive any radioactive dose from planned activities and worker radiological doses associated with the transportation and storage of RPVs are expected to be significantly below dose limits. Whilst there is a risk of accidental discharge, the probability of such an event occurring is considered to be very low. However, it is recognised that there may be anxiety relating in particular to the storage of RPVs which could have a negative effect on the health and wellbeing of residents in the vicinity of the interim storage facility although this is dependent on how the facility is perceived.	**0**

Stage V: Transport the RC/RPV/ILW to Interim Storage **Health and Wellbeing**	
Option 3: Packaged Waste Transport to Interim Storage	
Assessment of Effects: The range and significance of potential effects on the health and wellbeing of SDP workers and the local community identified in relation to Options 1 and 2 (as described above) are expected to be similar for packaged waste transportation and storage. Worker and public radiological doses are also expected to be significantly below limits (see Stage 3 for further information). It is assumed that regulator approved 3m^3 containers will be used for the packaged waste, irrespective of the mode of transport required. It is estimated that between 4 and 8 containers will be required for the packaged ILW arising from the dismantling of each submarine. An over-pack will also be required for the container during transportation, which although it has not been developed yet, is a common requirement across the nuclear industry to ensure safe and secure transportation of packaged waste. Given that the packaged waste will largely comprise of cut up steel, immobilised within a grout, any radiological discharge associated with the movement of each packaged waste container will be exceptionally low. No liquid ILW will be transported. There remains a risk of an unplanned incident during transportation or at the interim storage facility which could have a significant negative effect on the health and wellbeing of workers and the public. However, for contaminants to be released, necessary conditions would have to exist for the waste to become mobilised (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. It is assumed that packaged waste would be transported by road requiring the use of a wide/abnormal load vehicle and security escort would be required generating noise and vibration which could cause stress or anxiety to local communities alongside transport corridors. However, the frequency of movements (up to a maximum of 8 separate movements per annum) is such that any effects on this aspect of the objective are expected to be minor. There may also be an opportunity to transport PW by sea or rail which could reduce any negative effects. **Proposed Mitigation / Enhancements Measures:** • As the type of effects identified in relation to this option are similar to those under Stage 3, the proposed mitigation and enhancement measures are also considered to be same.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Public or other dockyard workers would not be expected to receive any radioactive dose from planned activities and worker radiological doses associated with the transportation and storage of packaged waste are expected to be significantly below dose limits. Whilst there is a risk of accidental discharge, the probability of such a risk occurring is considered to be low. However, it is recognised that there may be anxiety relating in particular to the storage of packaged waste which could have a negative effect on the health and wellbeing of residents although this is dependent on how the interim storage facility is perceived.	**0**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF

Health and Wellbeing

Option 1: Size Reduce the Reactor Compartment and Transfer Packaged Waste to the Proposed GDF

Assessment of Effects:

Dismantling, as part of the wider SDP process, is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In moving submarines from a marine environment and ensuring their responsible handling and dismantling, it is considered that the long term residual environmental hazard posed will be reduced.

Depending on the location of the interim storage facility and where RCs will be finally dismantled, there may be a requirement to transport RCs prior to processing. It is expected that, due to the size and weight of RCs, this will only occur by sea. As RCs will be sealed (in accordance with the Transport Regulations), it is not expected that there will be any discharge of radiological contaminants. It is also assumed that RCs would be passively safe (i.e. all liquids and potentially mobile radioactive materials would be removed or immobilised) and as such it is not expected that there will be any risk of accidental discharge of radiological contaminants during transportation.

Dismantling the RC after interim storage would allow the radioactive isotopes to decay for the longest possible time, minimising worker dose. The main driver for worker dose is the radioisotope Cobalt 60, with a half-life of 5.25 years; after 50 years of storage, its activity will fall by a factor of a thousand although there will be a small residual level of radioactivity from Co60, coupled with the continued presence of longer-lived isotopes such as Nickel 63 and Iron 55. Neither the public nor other dockyard workers would be expected to receive any planned radioactive dose from dismantling the RC. No releases of radiation into the environment are expected during transport of the packaged waste or LLW, because of the strict transport regulations that are (and are expected to remain) in place for the movement of radioactive materials. The risk of accidental radioactive discharges into the wider environment would be very low, especially as the components are mainly solid and radioactivity levels would have dropped considerably, as already described.

Whilst radiological doses will be significantly below limits and the risk of accidental discharge is very low, it is recognised that this may not be the perception held by the local communities. In this respect, anxiety relating to operational activity and in particular the radioactive waste element of site's operation may have a negative effect on the health and wellbeing of residents. Operational activity at the size reduction facility may also be used as a focus for anti nuclear sentiment and may be subject to protest action from opposition groups and local communities. This may potentially increase the fear of crime through the fear of vandalism and personal injury as a result of an influx of a large number of people into a local area.

Routine or accidental discharges of non-radioactive hazardous materials such as asbestos during the removal of equipment and materials within the RC hull may also have a significant effect on the health of SDP workers. However, it is assumed that the likelihood of either routine discharges affecting the health of SDP workers or accidental discharges occurring will be reduced through the adoption of stringent health and safety standards and through Environmental Permitting regimes and application of Best Available Techniques (BAT) for dismantling.

Recycling of the remaining non-radioactive RC casing may involve removal of materials containing hazardous waste such as asbestos. RC casings will also be shot blasted to remove paint and protective coatings which could release hazardous contaminants such as zinc phosphate, trimite and tanclene. Exposure of such hazardous materials and waste to contractors (as a result of either routine or accidental discharge) may have a significant negative effect on their health. However, the recycling will be subject to regulatory requirements such that the risk of any breach to these standards (and, therefore, any negative effects on health and wellbeing caused by exposure to workers) is considered to be minimal.

Both the dismantling process and subsequent RC casing recycling also carry health and safety risks similar to those associated with standard ship recycling and may include, for example, trips, falls or accidents associated with the use of cutting equipment. These risks will be managed through standard health and safety procedures such that effects are not expected to be significant.

Operational activity may result in increased emissions to air, which could affect those with respiratory problems in close proximity to the size reduction facility, and noise and vibration, which could cause stress or anxiety to local communities. Causes of emissions, noise and vibration are likely to include the loading and unloading of RCs and the use of cutting equipment during RPV removal. However, subsequent RPV processing and ILW packaging would be undertaken inside a size reduction facility building and consequently it has been assumed that associated emissions, noise and vibration would be predominantly contained within the site such that any adverse effects would be minor.

HGV movements required to transport materials, equipment and waste to/from the site and the movement of packaged waste using

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Health and Wellbeing	
wide/abnormal load vehicles will also generate some noise, vibration and emissions which could affect receptors alongside local transport networks in the vicinity of the size reduction facility as well as the LLWR and proposed GDF. The severity of these effects is dependent upon HGV routing and the proximity of sensitive receptors although it is not expected that the volume of movements would be significant. There may also be an opportunity to transport ILW and LLW by rail or, given the coastal location, sea which could reduce these effects. There will also be emissions of noise and vibration at the recycling facility associated with the break up of RC casings. However, as the works would be of a similar nature to those already undertaken on site, it is assumed that there would be no significant change to the existing baseline. **Proposed Mitigation / Enhancements Measures:** • Close consultation and full exchange of information with the local community, liaison with the local police and authorities, and the use of appropriate on-site security should minimise the risk of negative consequences of protest action, such as an increase in fear of crime. • Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators. • Engage the public on a continual basis in order to seek to reduce anxiety relating to radiological discharge. Options for engagement may include regular reporting of discharges via a dedicated website/press releases, creation of a community forum and/or regular attendance by SDP representatives at existing community meetings and development of educational opportunities. • The RC case recycling activities should demonstrate high environmental and health and safety performance. • Any health and safety risks arising from operational activities should be reduced by making use of BAT. • All operations will be subject to ALARP assessments which will ensure that radiological doses are As Low As Reasonably Practicable. • Transport packages for all options will be required to satisfy the Transport Regulations which is expected to limit the risk of an unplanned radiological release. • Contractors appointed to undertake works should demonstrate effective safety management systems and are expected to comply with all applicable health and safety legislation and regulations. • All works should be subject to risk assessment and hazard identification. • Work involving hazardous materials will be undertaken in accordance with the Control of Substances Hazardous to Health Regulations 2002 (as amended). Work involving asbestos will be carried out in accordance with the Control of Asbestos Regulations 2006. • Adopt HGV routing that seeks to avoid residential areas and existing AQMAs. • Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act • Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency. • Where possible, the use of mains electricity to power equipment would be preferential to diesel or petrol powered generators.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Public or other dockyard workers would not be expected to receive any radioactive dose from planned activities and worker radiological doses are expected to be below dose limits. Whilst there is a risk of accidental discharge, the probability of such a risk occurring is considered to be very low. However, it is recognised that there could be anxiety relating to operational activity and in particular the radioactive waste element of site's operation that may have a negative effect on the health and wellbeing of residents and there is also potential for operations to be subject to protest action from opposition groups which may increase community unease and concern. However, this is dependent on how the operations are perceived. Depending on the location and the proximity of local populations, noise, vibration and emissions associated with the use of	**-/+**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Health and Wellbeing	
equipment and traffic movements may also cause stress/anxiety to local communities, particularly during RPV removal. However, subsequent RPV dismantling to packaged waste would be undertaken inside a size reduction facility building and consequently it has been assumed that associated emissions, noise and vibration would be predominantly contained within the site such that any adverse effects would be minor. There will also be emissions of noise and vibration associated with the dismantling and recycling of RC casings although it is assumed that this would not represent a significant change to the existing baseline.	
Option 2: Size Reduce the Reactor Pressure Vessel and Transfer Packaged Waste to the Proposed GDF	
Assessment of Effects: The type and range of effects on this objective are expected to be similar to those associated with Option 1. Worker dose during RPV size reduction would be low, reflecting the fact that removal of the RPV would have already been completed. Once again, the public or other dockyard workers would not be expected to receive any planned or accidental radioactive dose from dismantling activities. It is recognised that there could be anxiety relating to operational activity and in particular the radioactive waste element of site's operation that may have a negative effect on the health and wellbeing of residents and there is also potential for operations to be subject to protest action from opposition groups that may increase community unease and concern. However, this is dependent on how the operations are perceived. The risk of accidental discharge associated with operational activities and the transportation of LLW may be viewed as being less than for Option 1. This reflects the fact that RPV removal would not be required with processing and packaging being undertaken inside a size reduction facility that is expected to contain any discharges. It is also expected that the number of LLW movements and, therefore, the risk of accidental discharge (e.g. as a result of collision or fire) would be less than for Option 1 as some LLW will have already been disposed of during Stage 3. As RPV dismantling to packaged waste would be undertaken inside a size reduction facility building, it is expected that any associated emissions, noise and vibration would be contained within the site such that there would not be any significant adverse effects (e.g. stress/anxiety) on the health and wellbeing of local communities. As the number of HGV movements would be reduced under this option (relative to Option 1), it is also likely that emissions to air, noise and vibration alongside local transport networks would be less although it is recognised that there is potential for the severity of these effects to be increased should the dismantling facility be sensitively located. However, there is potential for RPVs to be transported by road or rail from the interim storage facility to the size reduction facility which would require the use of a wide/abnormal load vehicle and security escort generating additional emissions, noise and vibration, although it is expected that any effects would only be temporary and infrequent (as only a single RPV would transported per year) and, consequently, are unlikely to be significant. As recycling of submarine hulls will have been undertaken, there would not be any additional effects on health and wellbeing in the vicinity of the ship recycling facility beyond those associated with Stage 4. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Public or other dockyard workers would not be expected to receive any radioactive dose from planned activities and worker radiological doses are expected to be below dose limits. Whilst there is a risk of accidental discharge, the probability of such a risk occurring is considered to be very low. However, it is recognised that there could be anxiety relating to operational activity and in particular the radioactive waste element of site's operation that may have a negative effect on the health and wellbeing of residents and there is also potential for operations to be subject to protest action from opposition groups which may increase community unease and concern. However, this is dependent on how the operations are perceived. Under this option it is expected that any associated emissions, noise and vibration would be contained within the site and the frequency of HGV movements low such that there would not be any significant stress or anxiety caused to local communities	**-/+**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Health and Wellbeing	
although it is recognised that there is potential for the severity of these effects to be increased should the size reduction facility be sensitively located.	
Option 3: Transport Packaged Waste to the Proposed GDF	
Assessment of Effects: Under Option 3 all dismantling, size reduction and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process) and consequently, effects on this objective will relate to the transportation of packaged waste to the proposed GDF only. These effects are expected to be similar to those associated with the transportation of packaged waste identified under Options 1 and 2. There is the potential for packaged waste to be transported at a higher frequency than 8 separate movements per annum (subject to the number of over-packs available and proposed GDF availability to receive packaged waste) as under this option no further processing prior to transportation to the proposed GDF would be required. As a high end estimate, if all packaged waste was to be moved over a period of 1 year with 2 overpacks, transport movements would occur approximately 4 times per week. This frequency of movement would result in increased emissions to air, which could affect those with respiratory problems alongside local transport networks, and noise and vibration, which could cause stress or anxiety to local communities. However, taking into account the fact that there would be no (or very few) standard HGV movements associated with this option and that any adverse effects would only be temporary (within the context of a project lasting decades), it is not expected that there would be any significant effects on health and wellbeing although this is dependent on a number of factors including whether packaged waste is transported by road or rail, the timing and routing of movements and the proximity of sensitive receptors. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: The purpose of the project is to provide a safe and secure approach to handling the redundant and defueled nuclear submarines. In moving them from a marine environment and ensuring their responsible handling and dismantling, this will lead to a reduction in the long term residual environmental hazard posed. Under Option 3 all dismantling, size reduction and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process). Public and worker radiological doses associated with the transportation of packaged waste from the size reduction facility to the GDF are expected to be significantly below dose limits and whilst there is a risk of accidental discharge, the probability of such a risk occurring is considered to be very low. It is assumed that packaged waste would be transported by road requiring the use of a wide/abnormal load vehicle and security escort, generating noise and vibration which could cause stress or anxiety to local communities alongside transport corridors. However, the frequency of movements is such that any effects on this aspect of the objective are expected to be minor. There may also be an opportunity to transport packaged waste by sea or rail which could reduce any negative effects.	**+/0**

Stage VII: Decommission SDP Facilities

Health and Wellbeing

Option 1: Decommission Greenfield Sites

Assessment of Effects:

Decommissioning activities are intended to manage and progressively reduce risks and hazards on Licensed/Authorised sites, ensuring the safe and secure storage of waste nuclear materials.

Health and safety risks associated with the decommissioning process will be similar to those encountered on a conventional demolition site (e.g. risks related to the use of heavy machinery, excavation and lifting) and it is assumed that all standard precautions will be taken to safeguard workers and the public. Notwithstanding this, the potential for worker injury under this option is expected to be greater than for Options 2 and 3 given the likely scale and duration of works required to restore SDP sites to a greenfield end state (which would include removal of all buildings, infrastructure and hardstanding) and, consequently, a requirement for a greater number of personnel to undertake the works.

The demolition, excavation, movement and treatment of radiologically contaminated material could result in the exposure of workers to the contaminants and any chemicals utilised during treatment. However, dose reduction measures would be applied to demonstrate the application of ALARP principles during decommissioning, minimising occupational dose, and it is anticipated that the Collective Worker Dose would be significantly below the annual individual worker dose limit of 20 mSv per annum. There is a potential risk of accidental discharge of radiation during decommissioning. However, activities will be closely regulated and subject to stringent health and safety standards which are expected to significantly reduce this risk.

Like conventional site demolition, there is a risk of accidental discharges of non-radioactive demolition-related materials to water, air or land and potential for the creation of new pollution pathways for existing contaminants on the site. However, it is considered that the probability of such effects occurring is low and pollution control management procedures would be adopted to help mitigate this risk.

Similar to those effects identified in relation to the construction of SDP facilities (Stages 1 and 2 of this assessment), there is potential for dust, noise and vibration associated with decommissioning activities to have a temporary effect on receptors in close proximity to SDP sites. HGV movements required to transport equipment, materials and waste to/from sites may also generate emissions and dust potentially affecting those with respiratory problems as well as noise and vibration affecting the quality of life of those residents alongside local transport networks. It is expected that the magnitude of these effects under this option will be greater than for Options 2 and 3 given the extent of works (and duration) required to restore SDP sites to a greenfield end state although, as they would only be temporary, they are not expected to be significant.

It is not expected that the number of employment posts created to support decommissioning activities would be of sufficient scale to warrant investment in additional services or facilities.

Following decommissioning, operating activities on the sites will cease which will result in removing the health risks associated with these activities (assessed in stages 3 to 6).

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim ILW storage facility compared to RPV and Packaged Waste options and, on a greenfield site, removal of docking facilities would also be required. Consequently, it is assumed that this technical option would require a greater number of workers and that the duration of works would be longer which may increase the potential for worker injury. In view of the scale of works, it is also considered that emissions of dust and noise and vibration associated with HGV movements and the use of plant equipment may be greater and would be felt over a longer duration thereby increasing the severity of effects on receptors in close proximity to the interim storage site.

Proposed Mitigation / Enhancements Measures:

- Seek to limit noise, dust and mobilisation of any contaminants during decommissioning as part of an environmental management plan.
- Adopt HGV routing which seeks to avoid residential areas and existing AQMAs.
- The following hierarchal approach to addressing hazards should be followed where possible – eliminate hazards through design; where

Stage VII: Decommission SDP Facilities Health and Wellbeing	
hazards cannot be designed out they should be isolated or protection to workers and the public should be provided; where the hazard cannot be avoided by protection or isolation, it's effects should be mitigated through design, process changes and management control measures. • Any health and safety risks arising from decommissioning activities should be reduced by making use of BAT. • All operations will be subject to ALARP assessments which will ensure that radiological doses are As Low As Reasonably Practicable. • Transport packages will be required to satisfy the Transport Regulations which is expected to limit the risk of an unplanned radiological release. • Contractors appointed to undertake works should demonstrate effective safety management systems and are expected to comply with all applicable health and safety legislation and regulations. • All works should be subject to risk assessment and hazard identification. • Work involving hazardous materials will be undertaken in accordance with the Control of Substances Hazardous to Health Regulations 2002 (as amended). Work involving asbestos will be carried out in accordance with the Control of Asbestos Regulations 2006.	
Summary: Decommissioning activities are intended to manage and progressively reduce risks and hazards on Licensed/Authorised sites, ensuring the safe and secure storage of waste nuclear materials. Furthermore operating activities on both sites will cease which will result in removing the health risks associated with these activities. Therefore in the long term it is expected that there will be a positive effect on this objective. However, in the shorter term, during the decommissioning works there will be the potential for negative effects on this objective. It is assumed that all standard precautions will be taken during these works to safeguard workers and the public such that health and safety risks are expected to be similar to those encountered on conventional demolition projects. There may also be risks associated with the excavation, movement and treatment of radiologically contaminated materials which could affect the health of contractors employed to undertake decommissioning works. However, it is assumed that worker doses would be below the annual individual worker dose limits and that the risk of accidental discharge is considered to be very low. Depending on the location and the proximity of local populations, there may be a negative effect on health and wellbeing from decommissioning activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from works and traffic). The severity of the potential effects on health associated with the decommissioning works related to the interim storage facility will be dependent on the technical option taken forward. In this respect, the RC option will require decommissioning of a relatively large interim storage facility including docking facilities which would increase the potential for adverse effects related to decommissioning works and HGV movements relative to the RPV and Packaged Waste options.	**-/+**
Option 2: Decommission Brownfield Sites	
Assessment of Effects: The type and range of effects on the health and wellbeing of SDP workers and the local community identified in relation to the decommissioning of SDP sites constructed on greenfield land (as described above) are expected to be similar for Option 2. It is expected that the severity of adverse effects would be reduced under this option as it is assumed that hardstanding and some infrastructure (e.g. docking facilities and roads) would be retained thereby reducing both the scale and duration of works and, therefore, the number of workers required to undertake decommissioning activities. However, it is assumed that brownfield sites would be located within or adjacent to an existing settlement and as such there may be greater potential for such sites to be in close proximity to sensitive receptors and within sensitive areas such as AQMAs although until the location of SDP sites has been identified this is currently uncertain. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim	

Stage VII: Decommission SDP Facilities

Health and Wellbeing

ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim ILW storage facility compared to RPV and Packaged Waste options. Consequently, it is assumed that this technical option would require a greater number of workers and that the duration of works would be longer which may increase the potential for worker injury. In view of the scale of works, it is also considered that emissions of dust and noise and vibration associated with HGV movements and the use of plant equipment may be greater and would be felt over a longer duration thereby increasing the severity of effects on receptors in close proximity to the interim storage site.

Proposed Mitigation / Enhancements Measures:

- No additional measures beyond those proposed for Option 1.

Summary: Decommissioning activities are intended to manage and progressively reduce risks and hazards on Licensed/Authorised sites, ensuring the safe and secure storage of waste nuclear materials. Furthermore operating activities on both sites will cease which will result in removing the health risks associated with these activities. Therefore in the long term it is expected that there will be a positive effect on this objective. However, in the shorter term, during the decommissioning works there will be the potential for negative effects on this objective. It is assumed that all standard precautions will be taken to safeguard workers and the public such that health and safety risks are expected to be similar to those encountered on conventional demolition projects. Under this option, these risks are expected to be reduced relative to Option 1 reflecting the smaller scale and shorter duration of decommissioning activity required to return SDP sites to a brownfield end state. There may also be risks associated with the excavation, movement and treatment of radiologically contaminated materials which could affect the health of contractors employed to undertake decommissioning works. However, it is assumed that worker doses would be below the annual individual worker dose limits and that the risk of accidental discharge is considered to be very low. Depending on the location and the proximity of local populations, there may be a negative effect on health and wellbeing from decommissioning activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from works and traffic). However, the severity of such potential disruption is likely to be less than for Option 1 (given the reduced scale and duration of works) although this may not be the case should SDP sites be sensitively located. The severity of the potential effects on health associated with the decommissioning works at the interim storage facility will be dependent on the technical option taken forward. In this respect, the RC option will require decommissioning of a relatively large interim storage facility which would increase the potential for adverse effects related to decommissioning works and HGV movements relative to the RPV and Packaged Waste options.	**-/+**

Option 3: Decommission Existing Licensed/Authorised Sites

Assessment of Effects:

The type and range of effects on the health and wellbeing of SDP workers and the local community identified under Option 2 (as described above) are expected to be similar (or less) for Option 3 as it is assumed that hardstanding, infrastructure (and potentially some structures) would also be retained following decommissioning such that the scale and duration of works (and the number of workers required to undertake decommissioning activities) would be comparable.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence of the technical options on

Stage VII: Decommission SDP Facilities Health and Wellbeing	
their severity is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: The type and range of effects on the health and wellbeing of SDP workers and the local community identified under Option 2 are expected to be similar (or less) for Option 3. Decommissioning activities are intended to manage and progressively reduce risks and hazards on Licensed/Authorised sites, ensuring the safe and secure storage of waste nuclear materials. Furthermore operating activities on both sites will cease which will result in removing the health risks associated with these activities. Therefore in the long term it is expected that there will be a positive effect on this objective. However, in the shorter term, during the decommissioning works there will be the potential for negative effects on this objective. In undertaking decommissioning works, it is assumed that all standard precautions will be taken to safeguard workers and the public such that health and safety risks are expected to be similar to those encountered on conventional demolition projects. Under this option, these risks are expected to be reduced relative to Option 1 and similar (or less) than Option 2 reflecting the smaller scale and shorter duration of decommissioning activity. There may also be risks associated with the excavation, movement and treatment of radiologically contaminated materials which could affect the health of contractors employed to undertake decommissioning works. However, it is assumed that worker doses would be below the annual individual worker dose limits and that the risk of accidental discharge is considered to be very low. Depending on the location and the proximity of local populations, there may be a negative effect on health and wellbeing from decommissioning activities (e.g. associated with the increase in traffic on the road network, noise, vibration and air quality effects from works and traffic). However, the scale of such potential disruption is likely to be less than that associated with Options 1 and 2. The severity of the potential effects on health associated with the decommissioning works at the interim storage facility will be dependent on the technical option taken forward. In this respect, the RC option will require decommissioning of a relatively large interim storage facility which would increase the potential for adverse effects related to decommissioning works and HGV movements relative to the RPV and Packaged Waste storage options.	**-/+**

3.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the health and wellbeing objective. **Box 3.2** provides a summary of the options that have been assessed.

Box 3.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 3.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.	-/0	-/0	-/0	**Potential Effects** The SDP is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In moving submarines from a marine environment and ensuring their responsible handling and dismantling, it is considered that the long term residual environmental hazard posed would be reduced. It is assumed that all standard precautions would be taken to safeguard workers and the public such that SDP activities would not result in any significant health and safety risks beyond those encountered on normal projects. However, there is a potential for dust, noise and vibration associated with SDP activities to have an effect on receptors within and in close proximity to the dockyards. HGV movements required to transport materials to/from the dockyards may generate emissions and dust potentially affecting those with respiratory problems as well as noise and vibrations affecting the quality life of those residents principally alongside local transport networks *(refer to impacts specific to the Devonport and Rosyth dockyards)*. Workers directly involved in operational activities would be exposed to radiation, for example during the removal of radiologically implicated systems during initial dismantling, and also interim storage, segregation, size reduction and transportation activities. However, as dose limits are strictly regulated and all regulations are subject to ALARP which would ensure that doses are As Low as Reasonably Practicable (ALARP), worker exposure to radiation would be minimal. The risk of unplanned radiological exposure is also considered to be exceptionally low during normal operations. The removal of radioactive components from the RC would be the most dose intensive activity, with very little dose associated with subsequent segregation/size reduction operations, since these would be carried out using hot cells. The maintenance and inspection of the RC during the interim storage period is considered to carry minimal risk, as the radioactive waste would be contained within the RC, with the RC made passively safe prior to storage, minimising the need for maintenance and inspection. Provided the passive safety and regulatory requirements have been met, there would also be minimal risk during transportation. The potential for accidents or incidents to occur when transporting radioactive waste is considered to be low, with no reported events to date having resulted in significant radiation doses to workers or members of the public.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	-/0	-/0	-/0	The Collective Worker Dose (i.e. the sum of the dose to all relevant workers) for the RC option is estimated to be 9 man mSv (based on the dismantling of HMS Conqueror which represents the "best estimate"). The RC option is anticipated to employ 80-135 personnel for RC separation, interim storage and delayed RPV removal, which produces an annual average dose rate of between 0.07 mSv and 0.11 mSv when considered against the Collective Worker Dose, although it would be anticipated that some members of the workforce would receive a higher dose rate depending on the nature of specific activities (such as the removal of steam generators and associated pipework). This estimated average annual dose rate compares to the annual individual worker dose limit of 20 mSv per annum. There is the potential for accidental release of pollutants and radioactive material during initial dismantling (RC cut out), segregation and size reduction of the RC, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV. However, the quantities of any irradiated materials at this point will be minimal (as they would be contained within the RC itself) and the risks of such unplanned discharge are considered to be very small. Due to the low level of initial intrusive activity within the RC, the risks of accidental discharge are also low. As the RC option also allows for the in-situ decay of short lived isotopes, following interim storage, radioactivity levels would have reduced, resulting in a reduced dose to workers. Routine or accidental discharges of non-radioactive hazardous materials such as asbestos during the removal of submarine equipment or pipework may also impact on the health and well-being of SDP workers. However, it is assumed that the likelihood of either routine

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				discharges affecting the health of SDP workers or accidental discharges occurring will be reduced through the adoption of stringent health and safety standards and through Environmental Permitting regimes and application of BAT for dismantling. The dismantling process also carries health and safety risks similar to those associated with standard ship recycling and may include, for example, trips, falls or accidents. These risks would be managed through standard health and safety procedures such that effects are not expected to be significant. As the Devonport and Rosyth dockyards are operational dockyards and assuming that SDP activities would take place within the nuclear licensed site within the dockyards away from local communities, any effects of SDP activities on the health and well-being of local communities is expected to be negligible, and primarily related to transport movements to and from the dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. However, this may not be the public's perception. In this respect, anxiety relating to operational activity and in particular the radioactive waste element of the SDP may have a negative effect on the local population. SDP facilities may be used as a focus for anti nuclear sentiment and may be subject to protest action from opposition groups, which may cause community unease and concern, and may potentially increase the fear of crime through the fear of vandalism and personal injury as a result of an influx of a larger number of people into a local area. No effects on existing local healthcare infrastructure and provision are anticipated at the Devonport or Rosyth dockyards, assuming that SDP activities would take place within the nuclear licensed site at the Devonport and Rosyth dockyards. The level of development required (and employment opportunities created) at the Devonport and Rosyth dockyards is not of sufficient scale to warrant investment in additional healthcare infrastructure.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	-/0	-/0	-/0	Of the technical options, taking account of interim storage requirements the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2. In consequence, the potential for any impact on health and well-being during construction could be greater. Notwithstanding this, in the case of the RC option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for dismantling and interim storage only. Construction of facilities for segregation and size reduction of the RC would not take place until the interim storage period is nearing completion. Separating activities into two phases may help to minimise disturbance and any negative effects on the health and well-being of local communities. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur. Although in the case of all of the technical options, no significant effects on health and well-being are anticipated. The RC option is considered to pose the least risk to workers from inadvertent radiological exposure associated with initial dismantling, as radioactive material would be contained within the RC and the RC is essentially self shielding. However, as the entire RC would be separated from the submarine, with the fore and aft sections subsequently requiring significant welding to seal them for transport there could be greater potential for the release of non-radiological pollutants to the environment at this stage when compared to the other options which involve RPV removal from the RC, with the RC to some extent acting as a shield, and less severance of the submarine hull. There would be minimal risk of inadvertent radiological exposure once the RC is in storage. As the RC option allows for the in-situ decay of short lived isotopes, following interim storage, radioactivity levels will have reduced. The delay from interim storage before size reduction begins may also provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. <u>Devonport Dockyard</u> In 2001, 66.7% of people in Plymouth rated their health as good; 23.2% rated their health as fair; and 10.1% of people rated their health as not good. Life expectancy is increasing, although remains slightly below the UK average and significant health inequalities exist. A 2007 study reported that Plymouth has higher cancer rates than the national average; however there was no geographic association of cancer with distance to the Tamar estuary, and no excess of cancers known to be radiation-sensitive. The excess of cancers was related to socio-economic deprivation, and in particular smoking. Devonport is a radon-affected area due to the prevalence of granite bedrock. 5 to 10% of dwellings in the Devonport area have been assessed as having radon levels above the accepted Action Level of 200 Becquerels per m^3 of air. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	-/0	-/0	-/0	In 2008/09 Devonport dockyards reportable accident frequency (how many accidents there were for every 100,000 man hours worked) was 0.27 – a reduction of 37% from 2007. Existing licensed activities at Devonport dockyard include permitted releases to air, sewer and the Hamoaze estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2009, the dose to the 'critical group' as a result of Devonport dockyard's discharges was calculated to be less than 0.005 mSv per year. This is about 0.5% of the statutory limit of 1.0 mSv (dose for members of the public). The results of environmental radioactivity monitoring programmes at Devonport dockyard show that there has been no significant radiological hazard to any member of the general public from radioactive discharges from the dockyard. Taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public at Devonport dockyard is not anticipated to come close to exceeding statutory dose limits. As the Devonport dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site of the dockyard away from local populations, any effects on the health and well-being of local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J – Material Assets (Transport)). <u>Rosyth Dockyard</u> The trend in Fife is of generally improving health. Average life expectancy in Fife is above average, although there is a high degree of health inequality across Fife. In 2005, the top three causes of death in Fife were diseases of the circulatory system and respiratory system, and neoplasms (tumours or abnormal growth of tissue). Fife is not a radon-affected area, with less than 1% of dwellings above the Action Level. The incidence of cancers around Rosyth is not significantly elevated. The incidence of childhood leukaemia and non-Hodgkin lymphoma is close to that expected (ratio of 1.03) but does not appear to decrease with distance from the base. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east,

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				and agricultural land. Existing licensed activities at Rosyth dockyard include permitted releases to air, sewer and the Forth estuary. They include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2009, gaseous discharges from Rosyth dockyard were below the limit of detection, and gamma dose rates could not be distinguished from background levels. Tritium and Cobalt-60 discharges to the Firth of Forth continue to decline and are well below authorised limits. In 2009, doses to those in the immediate vicinity of Rosyth were assessed to be less than 0.005 mSv (<0.5% of the dose limit). Taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public at Rosyth dockyard is not anticipated to come close to exceeding statutory dose limits. As the Rosyth dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site of the dockyard away from local populations, any effects on the health and well-being of local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J – Material Assets (Transport)). **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and scale of new development required could be greater at Devonport dockyard.

Assessment Criteria	Score			Commentary
	1D	1R	1B	
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	-/0	-/0	-/0	Devonport dockyard is located in the city of Plymouth in a densely populated and built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards, surrounding land uses and transport routing to/from the dockyards, along with the scale of development required, there is considered to be a greater potential for SDP activities at Devonport dockyard to affect the health and well-being of local communities when compared to Rosyth dockyard, due to the proximity of the dockyard to densely populated residential areas, the requirement to route traffic through the outskirts of the city and the scale of development required. Rosyth dockyard is situated in a less populated area with good transport links, and therefore fewer sensitive receptors could be affected at Rosyth dockyard. Notwithstanding this, any impact on health and well-being of local communities as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be negligible. There is not considered to be any difference in radiological risk between the two dockyards as taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public is not anticipated to come close to exceeding statutory dose limits at either dockyard. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Plymouth to impact on the health and well-being associated with the transport of waste. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any health and well-being impact from LLW transportation is anticipated to be negligible. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both dockyards for dismantling would reduce worker and local community radiation exposure. Utilising both dockyards would also enable faster initial dismantling of the existing laid-up submarines, reducing the potential for any impacts on health and well-being associated with the afloat storage of submarines, and reducing the timescale of the residual environmental hazard posed by redundant nuclear submarines.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.	-/0	-/0	-/0	**Potential Effects** The SDP is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In moving submarines from a marine environment and ensuring their responsible handling and dismantling, it is considered that the long term residual environmental hazard posed would be reduced. It is assumed that all standard precautions would be taken to safeguard workers and the public such that SDP activities would not result in any significant health and safety risks beyond those encountered on normal projects. However, there is a potential for dust, noise and vibration associated with SDP activities to have an effect on receptors within and in close proximity to the dockyards. HGV movements required to transport materials to/from the dockyards may generate emissions and dust potentially affecting those with respiratory problems as well as noise and vibrations affecting the quality life of those residents principally alongside local transport networks *(refer to impacts specific to the Devonport and Rosyth dockyards)*. Workers directly involved in operational activities would be exposed to radiation, for example during the removal of radiologically implicated systems during initial dismantling, and also interim storage, segregation, size reduction and transportation activities. However, as dose limits are strictly regulated and all regulations are subject to ALARP which would ensure that doses are As Low as Reasonably Practicable, worker exposure to radiation would be minimal. The risk of unplanned radiological exposure is also considered to be low during normal operations. The removal of radioactive components from around the RC during RPV removal would be the most dose intensive activity, with very little dose associated with subsequent segregation/size reduction operations, since these would be carried out using hot cells. The maintenance and inspection of the RPV during the interim storage period is considered to carry minimal risk, as the radioactive waste would be contained within the packaged RPV, with the RPV made passively safe prior to storage, minimising the need for maintenance and inspection. Provided the passive safety and regulatory requirements have been met, there would also be minimal risk during transportation. The potential for accidents or incidents to occur when transporting radioactive waste is considered to be low, with no reported events to date having resulted in significant radiation doses to workers or members of the public. The Collective Worker Dose (i.e. the sum of the dose to all relevant workers) for the RPV option is estimated to be 47 man mSv (based on the dismantling of HMS Conqueror which represents the "best estimate"). The RPV option is anticipated to employ between 60-105 personnel for RPV removal, interim storage and delayed RPV size reduction, which produces an annual average dose rate of between 0.45 mSv and 0.78 mSv when considered against the Collective Worker Dose, although it would be anticipated that some members of the workforce would receive a higher dose rate depending on the nature of specific activities (such as the removal of steam generators and associated pipework). This annual average dose rate, whilst greater than the RC option (due to the need to undertake work within the RC such as primary circuit isolation), would remain below the individual worker dose limit of 20 mSv per annum.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any	-/0	-/0	-/0	There is the potential for accidental release of pollutants during initial dismantling (RPV removal) and subsequent full dismantling (size reduction). This could include accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV during initial dismantling. The quantities of any irradiated materials at this point will be minimal (as they would predominantly be contained within the RPV itself and be in solid form). As such, the risks of such unplanned discharge are considered to be very small. As the RPV option also allows for the in-situ decay of short lived isotopes, following interim storage, radioactivity levels would have reduced, resulting in reduced dose to worker estimates. Routine or accidental discharges of non-radioactive hazardous materials such as asbestos

Assessment Criteria	Score			Commentary
	2D	2R	2B	
health risks associated with processing submarines. *(continued)*				during the removal of submarine equipment or pipework may also impact on the health and well-being of SDP workers. However, it is assumed that the likelihood of either routine discharges affecting the health of SDP workers or accidental discharges occurring will be reduced through the adoption of stringent health and safety standards and through Environmental Permitting regimes and application of BAT for dismantling. The dismantling process also carries health and safety risks similar to those associated with standard ship recycling and may include, for example, trips, falls or accidents. These risks would be managed through standard health and safety procedures such that effects are not expected to be significant. As the Devonport and Rosyth dockyards are operational dockyards and assuming that SDP activities would take place within the nuclear licensed site within the dockyards away from local communities, any effects of SDP activities on the health and well-being of local communities is expected to be negligible, and primarily related to transport movements to and from the dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. However, this may not be the public's perception. In this respect, anxiety relating to operational activity and in particular the radioactive waste element of the SDP may have a negative effect on the local population. SDP facilities may be used as a focus for anti nuclear sentiment and may be subject to protest action from opposition groups, which may cause community unease and concern, and may potentially increase the fear of crime through the fear of vandalism and personal injury as a result of an influx of a larger number of people into a local area. No effects on existing local healthcare infrastructure and provision are anticipated at the Devonport or Rosyth dockyards, assuming that SDP activities would take place within the nuclear licensed site at the Devonport and Rosyth dockyards. The level of development required (and employment opportunities created) at the Devonport and Rosyth dockyards is not of sufficient scale to warrant investment in additional healthcare infrastructure. Of the technical options, taking account of interim storage requirements the scale of development required for the RPV option would be smaller than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2. In consequence, any potential impact on health and well-being during construction could be less. In addition, in the case of the RPV option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation and size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases may help to minimise disturbance and any negative effects on the health and well-being of local communities. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur. Although in the case of all of the technical options, no significant effects on health and well-being are anticipated.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing	-/0	-/0	-/0	The RPV option is considered to carry more of a risk to workers from inadvertent radiological exposure associated with initial dismantling than the RC option, as the RPV would be removed from the RC in the case of this option. Therefore there would be a greater potential for the release of radioactive material to the environment at this stage. However, there is considered to be less potential for the release of non-radiological pollutants to the environment at this stage when compared to the RC option as the RC would to some extent act as a shield during RPV removal and less severance of the submarine hull would be required. There would be minimal risk of inadvertent radiological exposure once the RPV is in storage. As the RPV option allows for the in-situ decay of short lived isotopes, following interim storage radioactivity levels would have reduced resulting in a reduction in dose rates.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
submarines. *(continued)*				Subsequent size reduction of the RPV is therefore considered to pose less of a risk than the PW option. In addition, following interim storage the RPV would not need to be placed back into the DBV prior to segregation, thus reducing the potential for accidental discharge into the basin when compared to the RC option, which requires use of the DBV following initial dismantling. The delay from interim storage before segregation/size reduction begins may also provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. <u>Devonport Dockyard</u> In 2001, 66.7% of people in Plymouth rated their health as good; 23.2% rated their health as fair; and 10.1% of people rated their health as not good. Life expectancy is increasing, although remains slightly below the UK average and significant health inequalities exist. A 2007 study reported that Plymouth has higher cancer rates than the national average; however there was no geographic association of cancer with distance to the Tamar estuary, and no excess of cancers known to be radiation-sensitive. The excess of cancers was related to socio-economic deprivation, and in particular smoking. Devonport is a radon-affected area due to the prevalence of granite bedrock. 5 to 10% of dwellings in the Devonport area have been assessed as having radon levels above the accepted Action Level of 200 Becquerels per m^3 of air. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. In 2008/09 Devonport dockyards reportable accident frequency (how many accidents there were for every 100,000 man hours worked) was 0.27 – a reduction of 37% from 2007.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	-/0	-/0	-/0	Existing licensed activities at Devonport dockyard include permitted releases to air, sewer and the Hamoaze estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2009, the dose to the 'critical group' as a result of Devonport dockyard's discharges was calculated to be less than 0.005 mSv per year. This is about 0.5% of the statutory limit of 1.0 mSv (dose to the members of the public). The results of environmental radioactivity monitoring programmes at Devonport dockyard show that there has been no significant radiological hazard to any member of the general public from radioactive discharges from the dockyard. Taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public at Devonport dockyard is not anticipated to come close to exceeding statutory dose limits. As the Devonport dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site of the dockyard away from local populations, any effects on the health and well-being of local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J – Material Assets (Transport)). <u>Rosyth Dockyard</u> The trend in Fife is of generally improving health. Average life expectancy in Fife is above average, although there is a high degree of health inequality across Fife. In 2005, the top three causes of death in Fife were diseases of the circulatory system and respiratory

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				system, and neoplasms (tumours or abnormal growth of tissue). Fife is not a radon-affected area, with less than 1% of dwellings above the Action Level. The incidence of cancers around Rosyth is not significantly elevated. The incidence of childhood leukaemia and non-Hodgkin lymphoma is close to that expected (ratio of 1.03) but does not appear to decrease with distance from the base. This is being investigated. further. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Existing licensed activities at Rosyth dockyard include permitted releases to air, sewer and the Forth estuary. They include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2009, gaseous discharges from Rosyth dockyard were below the limit of detection, and gamma dose rates could not be distinguished from background levels. Tritium and Cobalt-60 discharges to the Firth of Forth continue to decline and are well below authorised limits. In 2009, doses to those in the immediate vicinity of Rosyth were assessed to be less than 0.005 mSv (<0.5% of the dose limit of 1 mSv). Taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public at Rosyth dockyard is not anticipated to come close to exceeding statutory dose limits. As the Rosyth dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site of the dockyard away from local populations, any effects on the health and well-being of local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J – Material Assets (Transport)). **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	-/0	-/0	-/0	Devonport dockyard is located in the city of Plymouth in a densely populated and built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards, surrounding land uses and transport routing to/from the dockyards, along with the scale of development required, there is considered to be a greater potential for SDP activities at Devonport dockyard to affect the health and well-being of local communities when compared to Rosyth dockyard, due to the proximity of the dockyard to densely populated residential areas, the requirement to route traffic through the outskirts of the city and the scale of development required. Rosyth dockyard is situated in a less populated area with good transport links, and therefore fewer sensitive receptors could be affected at Rosyth dockyard. Notwithstanding this, any impact on health and well-being of local communities as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be negligible. There is not considered to be any difference in radiological risk between the two dockyards as taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public is not anticipated to come close to exceeding statutory dose limits at either dockyard. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Plymouth to impact on the health and well-being associated with the transport of waste. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any health and well-being impact from LLW transportation is anticipated to be negligible. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both dockyards for dismantling would reduce worker and local community radiation exposure. Utilising both dockyards would also enable faster initial dismantling of the existing laid-up submarines, reducing the potential for any impacts on health and well-being associated with the afloat storage of submarines, and reducing the timescale of the residual environmental hazard posed by redundant nuclear submarines.

Options 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.	- /?/0	- /?/0	- /?/0	**Potential Effects** The SDP is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In moving submarines from a marine environment and ensuring their responsible handling and dismantling, it is considered that the long term residual environmental hazard posed would be reduced. It is assumed that all standard precautions would be taken to safeguard workers and the public such that SDP activities would not result in any significant health and safety risks beyond those encountered on normal projects. However, there is a potential for dust, noise and vibration associated with dismantling activities to have an effect on receptors within and in close proximity to the dockyards. HGV movements required to transport materials to/from the dockyards may generate emissions and dust potentially affecting those with respiratory problems as well as noise and vibrations affecting the quality life of those residents principally alongside local transport networks *(refer to impacts specific to the Devonport and Rosyth dockyards)*.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	- /?/0	- /?/0	- /?/0	Workers directly involved in operational activities would be exposed to radiation, for example during the removal of radiologically implicated systems during initial dismantling, and also interim storage, segregation, size reduction and transportation activities. However, as dose limits are strictly regulated and all regulations are subject to ALARP which would ensure that doses are As Low as Reasonably Practicable, worker exposure to radiation would be minimal. The risk of unplanned radiological exposure is also considered to be low during normal operations. The removal of radioactive components from around the RC during RPV removal would be the most dose intensive activity, with very little dose associated with subsequent size reduction operations, since these would be carried out using hot cells. The maintenance and inspection of the RPV during the interim storage period is considered to carry minimal risk, as the radioactive waste would be contained within the packaged RPV, with the RPV made passively safe prior to storage, minimising the need for maintenance and inspection. Provided the passive safety and regulatory requirements have been met, there would also be minimal risk during transportation. The potential for accidents or incidents to occur when transporting radioactive waste is considered to be low, with no reported events to date having resulted in significant radiation doses to workers or members of the public. The Collective Worker Dose (i.e. the sum of the dose to all relevant workers) for the RPV option is estimated to be 47 man mSv (based on the dismantling of HMS Conqueror which represents the "best estimate"). The RPV option is anticipated to employ between 60-105 personnel for RPV removal, interim storage and delayed RPV size reduction, which produces an annual average dose rate of between 0.45 mSv and 0.78 mSv when considered against the Collective Worker Dose, although it would be anticipated that some members of the workforce would receive a higher dose rate depending on the nature of specific activities (such as the removal of steam generators and associated pipework). This annual average dose rate, whilst greater than the RC option (due to the need to undertake work within the RC such as primary circuit isolation), would remain below the individual worker dose limit of 20 mSv per annum. There is the potential for accidental release of pollutants during initial dismantling and size reduction of the RPV. This includes accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV during initial dismantling. However, the quantities of any irradiated materials at this point will be minimal (as they would predominantly be contained within the RPV itself and be in solid form) and the risks of such unplanned discharge are considered to be very small. As the RPV option also allows for the in-situ decay of short lived isotopes, following interim storage, radioactivity levels would have reduced, resulting in a reduction of the total radioactivity that could potentially be discharged to the environment.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				Routine or accidental discharges of non-radioactive hazardous materials such as asbestos during the removal of submarine equipment or pipework may also impact on the health and well-being of SDP workers. However, it is assumed that the likelihood of either routine discharges affecting the health of SDP workers or accidental discharges occurring will be reduced through the adoption of stringent health and safety standards and through Environmental Permitting regimes and application of BAT for dismantling. The dismantling process also carries health and safety risks similar to those associated with standard ship recycling and may include, for example, trips, falls or accidents. These risks would be managed through standard health and safety procedures such that effects are not expected to be significant. As the Devonport and Rosyth dockyards are operational dockyards and assuming that dismantling activities would take place within the nuclear licensed site within the dockyards away from local communities, any effects of dismantling activities on the health and well-being of local communities is expected to be negligible, and primarily related to transport movements to and from the dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	- /?/0	- /?/0	- /?/0	In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation/size reduction (full dismantling of the RPV following interim storage). Similar to dismantling activities at the Devonport and Rosyth dockyards, assuming that the remote site is operational and SDP activities would take place within the site any effects of interim storage and segregation/size reduction activities on the health and well-being is anticipated to be minor and primarily related to transport movements to and from the remote site (the movement of construction materials, general wastes, the transport of the RPVs to site, and the transport of ILW and some LLW off-site). However, at this stage a site has not been identified and subsequently the effect of interim storage and segregation/size reduction activities on the health and well-being of local communities cannot be determined at this stage. There would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. However, this may not be the public's perception. In this respect, anxiety relating to operational activity and in particular the radioactive waste element of the SDP may have a negative effect on the local population. SDP facilities may be used as a focus for anti nuclear sentiment and may be subject to protest action from opposition groups, which may cause community unease and concern, and may potentially increase the fear of crime through the fear of vandalism and personal injury as a result of an influx of a larger number of people into a local area. No effects on existing local healthcare infrastructure and provision are anticipated at the Devonport or Rosyth dockyards, assuming that SDP activities would take place within the nuclear licensed site at the Devonport and Rosyth dockyards. The level of development required (and employment opportunities created) at the Devonport and Rosyth dockyards is not of sufficient scale to warrant investment in additional healthcare infrastructure. Irrespective of the eventual location of the remote site, the interim storage and segregation/size reduction activities would also not be of sufficient scale to warrant investment in additional healthcare infrastructure. Of the technical options, taking account of interim storage requirements the scale of development required for the RPV option would be smaller than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2. In consequence, any potential impact on health and well-being during construction could be less. In addition, construction would also take place on two different sites, reducing disturbance to local populations from SDP activities as the scale of activity undertaken at the respective sites would be less. In the case of the RPV option the construction of SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for segregation/size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases may help to minimise disturbance and any negative effects on the health and well-being of local communities. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur. The removal of the RPV from the RC prior to interim storage would increase the potential occupational radiation dose to SDP workers slightly, when compared to the RC storage option. However, Statutory ALARP principles would be applied to minimise dose to well within statutory limits.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	- /?/0	- /?/0	- /?/0	There would be minimal risk of inadvertent radiological exposure once the RPV is in storage. As the RPV option allows for the in-situ decay of short lived isotopes, following interim storage radioactivity levels would have reduced. Subsequent size reduction of the RPV is therefore a less dose intensive activity for workers than the PW option. In addition, following interim storage the RPV would not need to be placed back into the DBV prior to segregation, thus reducing the potential for accidental discharge into the basin when compared to the RC option, which requires use of the DBV following initial dismantling. The delay from interim storage before size reduction begins may also provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. In the case of this option as the RPV would need to be transported to the remote site following initial dismantling, there would be additional worker exposure to radiation from transport of the RPVs when compared to the options proposing storage at the point of waste generation, due to the requirement to transport the RPVs to a remote site for interim storage. Although in the case of all of the technical options, no significant effects on health and well-being are anticipated. <u>Devonport Dockyard</u> In 2001, 66.7% of people in Plymouth rated their health as good; 23.2% rated their health as fair; and 10.1% of people rated their health as not good. Life expectancy is increasing, although remains slightly below the UK average and significant health inequalities exist. A 2007 study reported that Plymouth has higher cancer rates than the national average; however there was no geographic association of cancer with distance to the Tamar estuary, and no excess of cancers known to be radiation-sensitive. The excess of cancers was related to socio-economic deprivation, and in particular smoking. Devonport is a radon-affected area due to the prevalence of granite bedrock. 5 to 10% of dwellings in the Devonport area have been assessed as having radon levels above the accepted Action Level of 200 Becquerels per m^3 of air. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. In 2008/09 Devonport dockyards reportable accident frequency (how many accidents there were for every 100,000 man hours worked) was 0.27 – a reduction of 37% from 2007. Existing licensed activities at Devonport dockyard include permitted releases to air, sewer

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				and the Hamoaze estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2009, the dose to the 'critical group' as a result of Devonport dockyard's discharges was calculated to be less than 0.005 mSv per year. This is about 0.5% of the statutory limit of 1.0 mSv (dose to members of the public). The results of environmental radioactivity monitoring programmes at Devonport dockyard show that there has been no significant radiological hazard to any member of the general public from radioactive discharges from the dockyard.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	- /?/0	- /?/0	- /?/0	Taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public at Devonport dockyard is not anticipated to come close to exceeding statutory dose limits. As the Devonport dockyard is an operational dockyard and assuming that dismantling activities would take place within the nuclear licensed site of the dockyard away from local populations, any effects on the health and well-being of local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J – Material Assets (Transport)). <u>Rosyth Dockyard</u> The trend in Fife is of generally improving health. Average life expectancy in Fife is above average, although there is a high degree of health inequality across Fife. In 2005, the top three causes of death in Fife were diseases of the circulatory system and respiratory system, and neoplasms (tumours or abnormal growth of tissue). Fife is not a radon-affected area, with less than 1% of dwellings above the Action Level. The incidence of cancers around Rosyth is not significantly elevated. The incidence of childhood leukaemia and non-Hodgkin lymphoma is close to that expected (ratio of 1.03) but does not appear to decrease with distance from the base. This is being investigated. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Existing licensed activities at Rosyth dockyard include permitted releases to air, sewer and the Forth estuary. They include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2009, gaseous discharges from Rosyth dockyard were below the limit of detection, and gamma dose rates could not be distinguished from background levels. Tritium and Cobalt-60 discharges to the Firth of Forth continue to decline and are well below authorised limits. In 2009, doses to those in the immediate vicinity of Rosyth were assessed to be less than 0.005 mSv (<0.5% of the dose limit of 1 mSv). Taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public at Rosyth dockyard is not anticipated to come close to exceeding statutory dose limits. As the Rosyth dockyard is an operational dockyard and assuming that dismantling activities would take place within the nuclear licensed site of the dockyard away from local populations, any effects on the health and well-being of local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J – Material Assets (Transport)). **<u>Comparison of the Options</u>** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. Devonport dockyard is located in the city of Plymouth in a densely populated and built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards,

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				surrounding land uses and transport routing to/from the dockyards, along with the scale of development required, there is considered to be a greater potential for SDP activities at Devonport dockyard to affect the health and well-being of local communities when compared to Rosyth dockyard, due to the proximity of the dockyard to densely populated residential areas, the requirement to route traffic through the outskirts of the city and the scale of development required. Rosyth dockyard is situated in a less populated area with good transport links, and therefore fewer sensitive receptors could be affected at Rosyth dockyard.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	- /?/0	- /?/0	- /?/0	Notwithstanding this, any impact on health and well-being of local communities as a result of dismantling activities at both the Devonport and Rosyth dockyards is anticipated to be negligible. There is not considered to be any difference in radiological risk between the two dockyards as taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public is not anticipated to come close to exceeding statutory dose limits at either dockyard. At this stage a remote site for interim storage and size reduction has not been identified and subsequently the potential effect of these activities on health and well-being is uncertain. The potential for effects would depend on the location of the remote site, the activities currently undertaken at the remote site and its proximity to local populations. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both dockyards for dismantling and a remote site for interim storage and segregation/size reduction would reduce worker and local community radiation exposure. Utilising both dockyards would also enable faster dismantling of submarines, reducing the timescale of the residual environmental hazard posed by redundant nuclear submarines.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.	-/0	-/0	-/0	**Potential Effects** The SDP is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In moving submarines from a marine environment and ensuring their responsible handling and dismantling, it is considered that the long term residual environmental hazard posed would be reduced. It is assumed that all standard precautions would be taken to safeguard workers and the public such that SDP activities would not result in any significant health and safety risks beyond those encountered on normal projects. However, there is a potential for dust, noise and vibration associated with SDP activities to have an effect on receptors within and in close proximity to the dockyards. HGV movements required to transport materials to/from the dockyards may generate emissions and dust potentially affecting those with respiratory problems as well as noise and vibrations affecting the quality life of those residents principally alongside local transport networks *(refer to impacts specific to the Devonport and Rosyth dockyards)*. Workers directly involved in operational activities would be exposed to radiation, for example during the removal of radiologically implicated systems during initial dismantling, and also interim storage, segregation, size reduction and transportation activities. However, as dose limits are strictly regulated and all regulations are subject to ALARP which would ensure that doses are As Low as Reasonably Practicable, worker exposure to radiation would be minimal. The risk of unplanned radiological exposure is also considered to be low during normal operations. The removal of radioactive components from around the RC during RPV removal would be the most dose intensive activity, with very little dose associated with subsequent segregation/size reduction operations, since these would be carried out using hot cells. The maintenance and inspection of the PW during the interim storage period is considered to carry minimal risk, as the radioactive waste would be packaged within approved long-term interim storage containers, minimising the need for maintenance and inspection. Provided the passive safety and regulatory requirements have been met, there would also be minimal risk during transportation. The potential for accidents or incidents to occur when transporting radioactive waste is considered to be low, with no reported events to date having resulted in significant radiation doses to workers or members of the public. The Collective Worker Dose (i.e. the sum of the dose to all relevant workers) for the PW option is estimated to be 50 man mSv (based on the dismantling of HMS Conqueror which represents the “best estimate”), The PW option is anticipated to employ 60-105 personnel for RPV removal, size reduction and interim storage, which produces an annual average dose rate of between 0.48 mSv and 0.83 mSv when considered against the Collective Worker Dose, although it would be anticipated that some members of the workforce would receive a higher dose rate depending on the nature of specific activities (such as the removal of steam generators and associated pipework). This annual average dose rate, whilst higher than the RC and RPV options due to the early dismantling and size reduction of the RPV, would remain below the individual worker dose limit of 20 mSv per annum. There is the potential for accidental release of pollutants during initial dismantling (RPV removal) including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV during initial dismantling. However, the quantities of any irradiated materials at this point will be minimal (as they would predominantly be contained within the RPV itself and in solid form) and the risks of such unplanned discharge are considered to be very small. Routine or accidental discharges of non-radioactive hazardous materials such as asbestos during the removal of submarine equipment or pipework may also impact on the health and well-being of SDP workers. However, it is assumed that the likelihood of either routine

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				discharges affecting the health of SDP workers or accidental discharges occurring will be reduced through the adoption of stringent health and safety standards and through Environmental Permitting regimes and application of BAT for dismantling. The dismantling process also carries health and safety risks similar to those associated with standard ship recycling and may include, for example, trips, falls or accidents. These risks would be managed through standard health and safety procedures such that effects are not expected to be significant.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	-/0	-/0	-/0	As the Devonport and Rosyth dockyards are operational dockyards and assuming that SDP activities would take place within the nuclear licensed site within the dockyards away from local communities, any effects of SDP activities on the health and well-being of local communities is expected to be negligible, and primarily related to transport movements to and from the dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. However, this may not be the public's perception. In this respect, anxiety relating to operational activity and in particular the radioactive waste element of the SDP may have a negative effect on the local population. SDP facilities may be used as a focus for anti nuclear sentiment and may be subject to protest action from opposition groups, which may cause community unease and concern, and may potentially increase the fear of crime through the fear of vandalism and personal injury as a result of an influx of a larger number of people into a local area. No effects on existing local healthcare infrastructure and provision are anticipated at the Devonport or Rosyth dockyards, assuming that SDP activities would take place within the nuclear licensed site at the Devonport and Rosyth dockyards. The level of development required (and employment opportunities created) at the Devonport and Rosyth dockyards is not of sufficient scale to warrant investment in additional healthcare infrastructure. Of the technical options, taking account of interim storage requirements the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with storage of PW expected to require1,005m^2. In consequence, the potential for any impact on health and well-being during construction for the PW option could be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full early dismantling of the RPV and size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on health and well-being from SDP activities as levels of activity and disturbance would be greater. Although as in the case of all of the technical options, no significant effects on health and well-being are anticipated. The PW option is associated with the most dose intensive activities as the RPV would be fully dismantled to packaged waste prior to interim storage and the decay of the short lived isotopes will not have occurred to the same extent as for the other two technical options. In consequence, the PW option also carries a slightly higher inherent risk to workers from inadvertent radiological exposure, due to the early segregation and size reduction of the RPV. Neverthless, the risk of unplanned radiological exposure is considered to be low because of the statutory safety requirements that are in place. <u>Devonport Dockyard</u> In 2001, 66.7% of people in Plymouth rated their health as good; 23.2% rated their health as fair; and 10.1% of people rated their health as not good. Life expectancy is increasing, although remains slightly below the UK average and significant health inequalities exist. A 2007 study reported that Plymouth has higher cancer rates than the national average; however there was no geographic association of cancer with distance to the Tamar estuary, and no excess of cancers known to be radiation-sensitive. The excess of cancers was related to socio-economic deprivation, and in particular smoking.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	-/0	-/0	-/0	Devonport is a radon-affected area due to the prevalence of granite bedrock. 5 to 10% of dwellings in the Devonport area have been assessed as having radon levels above the accepted Action Level of 200 Becquerels per m^3 of air. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. In 2008/09 Devonport dockyards reportable accident frequency (how many accidents there were for every 100,000 man hours worked) was 0.27 – a reduction of 37% from 2007. Existing licensed activities at Devonport dockyard include permitted releases to air, sewer and the Hamoaze estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2009, the dose to the 'critical group' as a result of Devonport dockyard's discharges was calculated to be less than 0.005 mSv per year. This is about 0.5% of the statutory limit of 1.0 mSv (dose to members of the public). The results of environmental radioactivity monitoring programmes at Devonport dockyard show that there has been no significant radiological hazard to any member of the general public from radioactive discharges from the dockyard. Taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public at Devonport dockyard is not anticipated to come close to exceeding statutory dose limits. As the Devonport dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site of the dockyard away from local populations, any effects on the health and well-being of local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J – Material Assets (Transport)). Rosyth Dockyard The trend in Fife is of generally improving health. Average life expectancy in Fife is above average, although there is a high degree of health inequality across Fife. In 2005, the top three causes of death in Fife were diseases of the circulatory system and respiratory system, and neoplasms (tumours or abnormal growth of tissue). Fife is not a radon-affected area, with less than 1% of dwellings above the Action Level. The incidence of cancers around Rosyth is not significantly elevated. The incidence of childhood leukaemia and non-Hodgkin lymphoma is close to that expected (ratio of 1.03) but does not appear to decrease with distance from the base. This is being investigated. further. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Existing licensed activities at Rosyth dockyard include permitted releases to air, sewer and the Forth estuary. They include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2009, gaseous discharges from Rosyth dockyard were below the limit of detection, and gamma dose rates could not be distinguished from background levels. Tritium and Cobalt-60 discharges to the Firth of Forth continue to decline and are well below authorised limits. In 2009, doses to those in the immediate vicinity of Rosyth were assessed to be less than 0.005 mSv (<0.5% of the dose limit of 1 mSv).

Assessment Criteria	Score			Commentary
	5D	5R	5B	
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	-/0	-/0	-/0	Taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public at Rosyth dockyard is not anticipated to come close to exceeding statutory dose limits. As the Rosyth dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site of the dockyard away from local populations, any effects on the health and well-being of local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J – Material Assets (Transport)). **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Devonport dockyard is located in the city of Plymouth in a densely populated and built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards, surrounding land uses and transport routing to/from the dockyards, along with the scale of development required, there is considered to be a greater potential for SDP activities at Devonport dockyard to affect the health and well-being of local communities when compared to Rosyth dockyard, due to the proximity of the dockyard to densely populated residential areas, the requirement to route traffic through the outskirts of the city and the scale of development required. Rosyth dockyard is situated in a less populated area with good transport links, and therefore fewer sensitive receptors could be affected at Rosyth dockyard. Notwithstanding this, any impact on health and well-being of local communities as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be negligible. There is not considered to be any difference in radiological risk between the two dockyards as taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public is not anticipated to come close to exceeding statutory dose limits at either dockyard. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Plymouth to impact on the health and well-being associated with the transport of waste. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any health and well-being impact from LLW transportation is anticipated to be negligible. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both dockyards for dismantling would reduce worker and local community radiation exposure.

Option 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.	0/-/?	0/-/?	0/-/?	**Potential Effects** The SDP is intended to provide a safe and secure solution for handling redundant and defueled nuclear submarines. In moving submarines from a marine environment and ensuring their responsible handling and dismantling, it is considered that the long term residual environmental hazard posed would be reduced. It is assumed that all standard precautions would be taken to safeguard workers and the public such that SDP activities would not result in any significant health and safety risks beyond those encountered on normal projects. However, there is a potential for dust, noise and vibration associated with dismantling activities to have an effect on receptors within and in close proximity to the dockyards. HGV movements required to transport materials to/from the dockyards may generate emissions and dust potentially affecting those with respiratory problems as well as noise and vibrations affecting the quality life of those residents principally alongside local transport networks *(refer to impacts specific to the Devonport and Rosyth dockyards)*. Workers directly involved in operational activities would be exposed to radiation, for example during the removal of radiologically implicated systems during initial dismantling, and also interim storage, segregation, size reduction and transportation activities. However, as dose limits are strictly regulated and all regulations are subject to ALARP which would ensure that doses are As Low as Reasonably Practicable, worker exposure to radiation would be minimal. The risk of unplanned radiological exposure is also considered to be low during normal operations. The removal of radioactive components from around the RC during RPV removal would be the most dose intensive activity, with very little dose associated with subsequent segregation/size reduction operations, since these would be carried out using hot cells. The maintenance and inspection of the PW during the interim storage period is considered to carry minimal risk, as the radioactive waste would be packaged within approved long-term interim storage containers, minimising the need for maintenance and inspection. Provided the passive safety and regulatory requirements have been met, there would also be minimal risk during transportation. The potential for accidents or incidents to occur when transporting radioactive waste is considered to be low, with no reported events to date having resulted in significant radiation doses to workers or members of the public. The Collective Worker Dose (i.e. the sum of the dose to all relevant workers) for the PW option is estimated to be 50 man mSv (based on the dismantling of HMS Conqueror which represents the "best estimate"), The PW option is anticipated to employ 60-105 personnel for RPV removal, size reduction and interim storage, which produces an annual average dose rate of between 0.48 mSv and 0.83 mSv when considered against the Collective Worker Dose, although it would be anticipated that some members of the workforce would receive a higher dose rate depending on the nature of specific activities (such as the removal of steam generators and associated pipework). This annual average dose rate, whilst higher than the RC and RPV options due to the early dismantling and size reduction of the RPV, would remain below the individual worker dose limit of 20 mSv per annum. There is the potential for accidental release of pollutants during initial dismantling (RPV removal) and size reduction of the RPV, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV during initial dismantling. However, the quantities of any irradiated materials at this point will be minimal (as they would predominantly be contained within the RPV itself and are in solid form) and the risks of such unplanned discharge are considered to be very small. Routine or accidental discharges of non-radioactive hazardous materials such as asbestos during the removal of submarine equipment or pipework may also impact on the health and well-being of SDP workers. However, it is assumed that the likelihood of either routine discharges affecting the health of SDP workers or accidental discharges occurring will be reduced through the adoption of stringent health and safety standards and through

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				Environmental Permitting regimes and application of BAT for dismantling.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	0/-/?	0/-/?	0/-/?	The dismantling process also carries health and safety risks similar to those associated with standard ship recycling and may include, for example, trips, falls or accidents. These risks would be managed through standard health and safety procedures such that effects are not expected to be significant. As the Devonport and Rosyth dockyards are operational dockyards and assuming that dismantling activities would take place within the nuclear licensed site within the dockyards away from local communities, any effects of initial dismantling and segregation/size reduction activities on the health and well-being of local communities is expected to be negligible, and primarily related to transport movements to and from the dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*. In the case of this option, following size reduction of the RPV, the PW would be transported off the segregation/size reduction dockyard to a remote site for interim storage. Similar to dismantling activities at the Devonport and Rosyth dockyards, assuming that the remote site is operational and interim storage activities would take place within the site any effects of interim storage on the health and well-being is anticipated to be negligible and primarily related to transport movements to and from the remote site (the movement of construction materials, general wastes, the transport of the RPVs to site, and the transport of PW off-site). However, at this stage a site has not been identified and subsequently the effect of interim storage activities on the health and well-being of local communities cannot be determined at this stage. There would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. However, this may not be the public's perception. In this respect, anxiety relating to operational activity and in particular the radioactive waste element of the SDP may have a negative effect on the local population. SDP facilities may be used as a focus for anti nuclear sentiment and may be subject to protest action from opposition groups, which may cause community unease and concern, and may potentially increase the fear of crime through the fear of vandalism and personal injury as a result of an influx of a larger number of people into a local area. No effects on existing local healthcare infrastructure and provision are anticipated at the Devonport or Rosyth dockyards, assuming that SDP activities would take place within the nuclear licensed site at the Devonport and Rosyth dockyards. The level of development required (and employment opportunities created) at the Devonport and Rosyth dockyards is not of sufficient scale to warrant investment in additional healthcare infrastructure. Irrespective of the eventual location of the remote site, the interim storage activities would also not be of sufficient scale to warrant investment in additional healthcare infrastructure. Of the technical options, taking account of interim storage requirements the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with storage of PW expected to require1,005m^2. In consequence, the potential for any impact on health and well-being during construction for the PW option could be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full early dismantling of the RPV and segregation/size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on health and well-being from SDP activities as levels of activity and disturbance would be greater. Notwithstanding this, undert this option, SDP activities would take place on different sites, reducing any impacts from SDP activities as the scale of activity undertaken at the respective sites would be less.Although in the case of all of the technical options, no significant effects on health and well-being are anticipated.
C. Health and Wellbeing	0/-	0/-	0/-	The PW option is associated with the most dose intensive activities as the RPV would be fully dismantled to packaged waste prior to interim storage and the decay of the short lived

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines. *(continued)*	/?	/?	/?	isotopes will not have occurred to the same extent as for the other two technical options. In consequence, the PW option also carries a slightly higher inherent risk to workers from inadvertent radiological exposure, due to the early size reduction of the RPV. Neverthless, the risk of unplanned radiological exposure is considered to be low because of the statutory safety requirements that are in place. In the case of this option as the PW would be transported from the segregation/size reduction site to a remote site , there would be additional worker exposure to radiation from transport of the PW when compared to the options proposing storage at the point of waste generation. Although in the case of all of the technical options, no significant effects on health and well-being are anticipated. <u>Devonport Dockyard</u> In 2001, 66.7% of people in Plymouth rated their health as good; 23.2% rated their health as fair; and 10.1% of people rated their health as not good. Life expectancy is increasing, although remains slightly below the UK average and significant health inequalities exist. A 2007 study reported that Plymouth has higher cancer rates than the national average; however there was no geographic association of cancer with distance to the Tamar estuary, and no excess of cancers known to be radiation-sensitive. The excess of cancers was related to socio-economic deprivation, and in particular smoking. Devonport is a radon-affected area due to the prevalence of granite bedrock. 5 to 10% of dwellings in the Devonport area have been assessed as having radon levels above the accepted Action Level of 200 Becquerels per m^3 of air. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. In 2008/09 Devonport dockyards reportable accident frequency (how many accidents there were for every 100,000 man hours worked) was 0.27 – a reduction of 37% from 2007. Existing licensed activities at Devonport dockyard include permitted releases to air, sewer and the Hamoaze estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2009, the dose to the 'critical group' as a result of Devonport dockyard's discharges was calculated to be less than 0.005 mSv per year. This is about 0.5% of the statutory limit of 1.0 mSv (dose to members of the public). The results of environmental radioactivity monitoring programmes at Devonport dockyard show that there has been no significant radiological hazard to any member of the general public from radioactive discharges from the dockyard.
C. Health and Wellbeing Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.	0/-/?	0/-/?	0/-/?	Taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public at Devonport dockyard is not anticipated to come close to exceeding statutory dose limits. As the Devonport dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site of the dockyard away from local populations, any effects on the health and well-being of local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J – Material Assets (Transport)). <u>Rosyth Dockyard</u> The trend in Fife is of generally improving health. Average life expectancy in Fife is above average, although there is a high degree of health inequality across Fife. In 2005, the top three causes of death in Fife were diseases of the circulatory system and respiratory system, and neoplasms (tumours or abnormal growth of tissue).

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
(continued)				Fife is not a radon-affected area, with less than 1% of dwellings above the Action Level. The incidence of cancers around Rosyth is not significantly elevated. The incidence of childhood leukaemia and non-Hodgkin lymphoma is close to that expected (ratio of 1.03) but does not appear to decrease with distance from the base. This is being investigated. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Existing licensed activities at Rosyth dockyard include permitted releases to air, sewer and the Forth estuary. They include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2009, gaseous discharges from Rosyth dockyard were below the limit of detection, and gamma dose rates could not be distinguished from background levels. Tritium and Cobalt-60 discharges to the Firth of Forth continue to decline and are well below authorised limits. In 2009, doses to those in the immediate vicinity of Rosyth were assessed to be less than 0.005 mSv (<0.5% of the dose limit of 1 mSv). Taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public at Rosyth dockyard is not anticipated to come close to exceeding statutory dose limits. As the Rosyth dockyard is an operational dockyard and assuming that SDP activities would take place within the nuclear licensed site of the dockyard away from local populations, any effects on the health and well-being of local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J – Material Assets (Transport)). **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Devonport dockyard is located in the city of Plymouth in a densely populated and built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land.

<table>
<tr><th rowspan="2">Assessment Criteria</th><th colspan="3">Score</th><th rowspan="2">Commentary</th></tr>
<tr><th>6/8D</th><th>6/8R</th><th>6/8B</th></tr>
<tr><td>C. Health and Wellbeing

Protect and enhance health, safety and wellbeing of workers and communities; minimise any health risks associated with processing submarines.

(continued)</td><td>0/-/?</td><td>0/-/?</td><td>0/-/?</td><td>Taking account of the location of the Devonport and Rosyth dockyards, surrounding land uses and transport routing to/from the dockyards, along with the scale of development required, there is considered to be a greater potential for SDP activities at Devonport dockyard to affect the health and well-being of local communities when compared to Rosyth dockyard, due to the proximity of the dockyard to densely populated residential areas, the requirement to route traffic through the outskirts of the city and the scale of development required. Rosyth dockyard is situated in a less populated area with good transport links, and therefore fewer sensitive receptors could be affected at Rosyth dockyard. Notwithstanding this, any impact on health and well-being of local communities as a result of dismantling activities at both the Devonport and Rosyth dockyards is anticipated to be minor.

There is not considered to be any difference in radiological risk between the two dockyards as taking account of existing dose rates and estimated collective dose limits, radiological exposure to workers and the public is not anticipated to come close to exceeding statutory dose limits at either dockyard.

At this stage a remote site for interim storage has not been identified and subsequently the potential effect of these activities on health and well-being is uncertain. The potential for effects would depend on the location of the remote site, the activities currently undertaken at the remote site and its proximity to local populations.

<u>Combination Option</u>

If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined.

However, it is noted that as submarine dismantling activities would be undertaken on three different sites (initial dismantling of the RPV taking place at one dockyard, and full segregation of the RPV taking place at the other dockyard and interim storage of the PW at a remote site), this combination option could result in a greater number of transport movements compared to Options 6/8D and 6/8R. Option 6/8B could therefore have a greater potential for impacts on health and well-being associated with transport. Notwithstanding this, undertaking SDP activities on three different sites may help to reduce disturbance levels.</td></tr>
</table>

A4. Health (Noise and Vibration)

4.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. A range of siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on health with regard to noise and vibration. Information is presented for both national and sub-regional levels.

Noise in this context is defined as 'unwanted sound' and in particular the appraisal will consider whether changes in noise levels may result in nuisance, relative to existing background noise levels.

There are links between the noise topic and other topics in the SEA, including transport, population and human health and wellbeing.

4.2 Summary of Plans and Programmes

4.2.1 International

The ***Environmental Noise Directive*** (2002/49/EC) requires that member states determine exposure to environmental noise through noise mapping, e.g. for major urban areas, roads, railways and airports, and ensure that information on environmental noise and its effects is made available to the public. Member states must also adopt action plans based upon the noise mapping results with a view to preventing and reducing environmental noise, particularly where it has a harmful effect on human health. The Environmental Noise Directive also makes specific reference to paying attention to 'quiet areas' in agglomerations that may be discernable from the noise maps, and requires Member States to identify and where possible protect quiet areas. Research into this is currently being carried out by Defra.

The ***EU's Sixth Environmental Action Plan*** (2002-2012) takes a broad look at the environmental challenges and provides a strategic framework for the Commission's environmental policy up to 2012. Within this action plan there is a long-term objective which states: *"to achieve reduction of the number of people regularly affected by long-term high noise levels from an estimated 100 million in 2000 by around 10% in 2010, and by 20% in 2020".*

The World Health Organisation (WHO) provide recommendations for guideline levels related to noise in ***Guidelines for Community Noise (1999)*** to prevent critical health effects including LAeq levels for outdoor living areas, dwelling indoors, inside bedrooms and sound pressure levels for impulse sounds, and also in ***Night Noise Guidelines for Europe (2009)*** to avoid health impacts from exposure to noise during sleep.

The WHO also produced a report entitled ***Transport, Environment and Health (2000)*** which summarises the latest scientific evidence on the impact of transport-generated air pollution, noise and accidents on behaviour and physical and mental health. It also identifies that the challenge is to promote healthy and sustainable transport alternatives to prevent the negative effects of transport systems on human health.

4.2.2 National

UK

The ***Environmental Protection Act (1990)*** defines the legal framework with England, Scotland and Wales for duty of care for waste, contaminated land and statutory nuisance (including noise emitted from premises so as to be prejudicial to health or a nuisance. Essential operational military activities such as training and flying are exempt from Part III of the Environmental Protection Act 1990 and Directive 2002/49/EC on the Assessment and Management of Environmental Noise.[186] However this only applies to operational activities directly related to national security. MOD establishments are not allowed to create excessive noise liable to cause a nuisance as part of activities not directly connected with the operation of equipment, training of personnel or other military operations.

Further provisions with respect to noise (as well as waste disposal, water pollution, atmospheric pollution and public health) are set out in the ***Control of Pollution Act 1974.***

Noise, litter and waste controls are introduced in the ***Clean Neighbourhoods and Environment Act 2005.***

The UK ***planning system*** recognises that noise has the potential to seriously impact on quality of life and to cause disturbance to sensitive ecological receptors.

The ***Control of Noise (Codes of Practice for Construction and Open Sites) (2002) SI 461*** approves

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[186] The Pattern of Military Low flying across the United Kingdom 2007/2008 http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/AirSafetyandAviationPublications/MilitaryLowFlying/AnnualReports/

four British Standards Institution codes of practice for appropriate methods of minimising noise and vibration from construction and open sites in UK.

The ***Noise Emission in the Environment by Equipment for Use Outdoors Regulations 2001 SI 1701*** establishes maximum noise levels for equipment used outdoors, mainly in construction and land maintenance.

Each of the devolved adminstrations (England, Wales, Scotland and Northern Ireland) transpose the requirements of the Environmental Noise Directive into regulations for that administration in the ***Environmental Noise Regulations (2006).***

However as stated in the ***JSP 418 Leaflet 15, Statutory Nuisance***.the MOD has exemption from the health and statutory nuisances provisions of ***Part III of the Environmental Protection Act***, in relation to Clause 79 (1) (g) - noises emitted from premises so as to be prejudicial to health or a nuisance.

As described in ***JSP 815, Defence Environment and Safety Management)*** MOD must conduct defence activities in a way that minimises the risk to personnel and to others, including members of the public, to As Low as is Reasonably Practicable (ALARP).

England

The ***Noise Policy Statement for England (2010)*** sets out the long term vision of Government noise policy, which is: *"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development"*

The long term vision is supported by the following aims through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

Planning Policy Guidance 24: Planning and Noise provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions or burdens on development or business. It sets out that local authorities should generally regard housing, hospitals and schools as noise-sensitive development.

Scotland

The Scottish Executive's ***Planning Advice Note: PAN 56 Planning and Noise*** (1999) includes the following:

- indicates how noise issues should be handled in development plans and development control;
- outlines ways of mitigating the adverse impact of noise;
- provides specific guidance on noisy and noise-sensitive development;
- introduces the use of noise exposure categories; and
- gives guidance on the use of planning conditions relating to noise.

Scottish Executive Development Department Circular 10/1999 - Planning and Noise informs that development plans should:

- guide noise-sensitive developments away from existing sources of significant noise or from programmed development such as new roads or areas reserved for noisy uses or activities; and
- ensure that potentially noisy developments are located in areas where noise will not be such an important consideration or where its impact can be contained or minimised.

Wales

The ***Technical Advice Note 11:Noise*** sets out that local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions.

The land use planning policies of WAG are set out in ***Planning Policy Wales*** (2010). With regard to noise, PPW states that local planning authorities should make a careful assessment of likely noise levels where appropriate and have regard to any relevant Noise Action Plan before determining planning applications

Northern Ireland

Apart from the Northern Ireland versions of ***Control of Noise (Codes of Practice for Construction and***

Open Sites) Order (Northern Ireland) 2002 and ***Clean Neighbourhoods and Environment Act (Northern Ireland) 2011*** and other plans and programmes at a UK level no further were identified on a Northern Ireland level.

4.2.3 Sub-regional locations

Plymouth

No plans or programmes related to noise were identified at the Plymouth level.

Fife

No plans or programmes related to noise were identified at the Fife level.

4.3 Overview of the Baseline

4.3.1 National

UK

Noise and vibration are predominantly local in nature and difficult to measure on a regional or national scale.[187]

In 2008 26% of people surveyed in the National Noise Survey Report were disturbed by residential sources of noise and 10% were disturbed by non-residential sources of noise. [188] Traffic, alarms, fireworks and children were the most cited causes of disturbing noise.[188]

MOD's activities that are principal sources of noise are flying from airfields include; ground-running and testing of engines; low flying; and use of air, gunnery and explosive ranges. There is no central analysis of MOD sources of environmental noise.[189]

[187] Environmental Protection UK, National Noise Survey Report 2008, http://www.environmental-protection.org.uk/assets/library/documents/National_Noise_Survey_2008.pdf
[188] Environmental Protection UK, National Noise Survey Report 2008, http://www.environmental-protection.org.uk/assets/library/documents/National_Noise_Survey_2008.pdf
[189] MOD, Aircraft Environmental Noise Report, revised version dated May 2008, http://www.mod.uk/NR/rdonlyres/72677C06-190B-41F0-A166-F28AABED2CEB/0/WRAYReportRevisedHolmesFOIRequestPartialUnredact.pdf

England and Wales

The number of noise complaints received by Environmental Health Officers in England and Wales (measured in rates per million of the population) in 2001/02 was 7,670.[190]

Interactive noise maps of certain cities and large urban areas in England can be generated from Defra's noise map for England.[191]

Wales Noise Mapping indicates that road traffic is the most dominant noise exposure source. [192]

Scotland

In 2008/09 a total of 58,313 noise complaints were received by local authorities in Scotland.[193] Scottish Noise Mapping indicates that road traffic is the dominant noise exposure source. [194]

Northern Ireland

In 2008/09 a total of 11,099 noise complaints were received by local authorities in Northern Ireland. [195] Northern Ireland Noise Mapping indicates that road traffic is the dominant noise exposure source. [196]

4.3.2 Sub-regional locations

Plymouth

The major sources of noise in Plymouth are domestic sources, traffic and construction.[197] Plymouth City Airport and Moorcroft Quarry also are sources of considerable noise on the eastern edge of Plymouth.[198]

Large developments in Plymouth are required to adopt and comply with Codes of Practice to manage

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[190] Office for National Statistics, Noise complaints received by Environmental Health Officers, http://www.statistics.gov.uk/cci/nscl.asp?ID=6914
[191] http://www.defra.gov.uk/environment/quality/noise/environmental-noise/mapping/
[192] Welsh Assembly Government, Population Exposure, http://wales.gov.uk/desh/research/research/noise/populationexposure/populationexposure.xls?lang=en
[193] The Scottish Government, 2009, Noise Complaints, http://www.scotland.gov.uk/Topics/Statistics/Browse/Environment/seso/sesoSubSearch/Q/SID/53
[194] The Scottish Government, 2007, Noise Exposure Statistics Reported to Europe, http://www.scottishnoisemapping.org/public/noise-statistics.aspx
[195] Department of the Environment, 2009, Noise Complaint Statistics for Northern Ireland, http://www.doeni.gov.uk/noise_complaint_statistics_report_for_northern_ireland_200809.pdf
[196] http://www.noiseni.co.uk/index/maps-and-charts.htm
[197] Plymouth City Council, Scoping Report communication, Feb 2011.
[198] Plymouth Sustainable Neighbourhoods Study (2005), http://www.plymouth.gov.uk/homepage/environmentandplanning/planning/planningpolicy/ldf/ldfbackgroundreports/brsustainableneighbourhoodassessments/snamethodology.htm

noise on their sites to within thresholds set by Plymouth City Council.[199]

Fife

The major source in noise in Fife is the A90 North of the Forth Bridge[200]

In 2007-08 Fife Council received 325 non-domestic noise complaints, one of which resulted in formal action being taken, compared to 305 non-domestic noise complaints in 2007/09. [201]

4.4 Existing problems

4.4.1 National

UK

Ambient noise levels are gradually increasing in the UK as a result of an increasing - and increasingly mobile - population. The cumulative impacts of noise on sensitive groups in local communities may create or exacerbate existing health issues.

No further issues specific to England, Scotland, Wales and Northern Ireland were identified in addition to the overall increase in ambient noise within the UK.

4.4.2 Sub-regional locations

Plymouth

Traffic noise on major roads in Plymouth has a significant area of affect either side of those roads, particularly where open spaces exist.[202]

Fife

Noise pollution caused by the growth in road transport and congestion is a key issue for Fife.

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[199] Plymouth City Council, Website, http://www.plymouth.gov.uk/homepage/environmentandplanning/pollution/noise.htm
[200] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1
[201] Fife Council, Statutory Performance Indicators, 2008-09, http://www.fife.gov.uk/uploadfiles/publications/c64_SPIBOOKLETFINAL2008-091.pdf
[202] Defra, Noise Mapping, Major Roads, http://www.defra.gov.uk/environment/quality/noise/environment/mapping/roads.htm

4.5 Likely evolution of the baseline

4.5.1 National

UK

It is difficult to quantify the likely evolution of noise in UK although it seems likely that new development will result in increases in noise levels and could thereby negatively affect people's health and the environment (e.g. disturbance to biodiversity, decreased enjoyment of the countryside). Conversely the Environmental Noise Regulation which requires Defra to produce Noise Action Plans may result in the reduction of noise in priority areas over time.

It needs to be recognised that as the effects of noise are felt at the local level it is possible that even if noise levels in UK as a whole increase or decrease, there is the potential that at the local level noise could improve or get worse as a result of an individual development, e.g. if a quieter processes replaces existing development. The noise from transport could also decline in the future due to quieter technology being employed in cars, buses and aeroplanes, although if the overall volume of traffic increases this could result in increase noise levels. Further noise maps will be produced in 2011 by Defra which may allow a comparison to be made with existing data for urban areas and transport routes.

England and Wales

The number of noise complaints received by Environmental Health Officers in England and Wales (measured in rates per million of the population) more than doubled between 1990/91 and 2000/01 from 3,644 to 7,670 per million of the population. The greatest increase in noise complaints has been from domestic sources with an increase of 145% over the 10 year period whilst industrial/commercial sources increased by 39.4% to a rate of 1,273 per million of the population [203]

Scotland

Data issued by the Scottish Government highlights that after peaking at 10,460 in 1997/8, the total number of complaints about noise received by Scottish councils dropped each year, to 9,165 in 2001/2002, before rising significantly to 28,217 in 2005/2006. After the introduction of the new way of reporting the number of noise complaints, the total number of noise complaints rose to 55,962 in 2006/07 and increased further to 58,313 in 2008/2009. These large increases in the number of noise complaints made to councils between 2005/06 and 2006/07 were mainly due to the introduction of dedicated noise

[203] Office for National Statistics, Noise complaints received by Environmental Health Officers, http://www.statistics.gov.uk/cci/nscl.asp?ID=6914

teams in local authorities. [204]

Northern Ireland

There has been a 42% increase in total noise complaints made between 2003/04 and 2006/07 in Northern Ireland. There was a subsequent decrease of 2% in the total complaints received between 2006/07 and 2007/08 and further reduction of 5% between 2007/08 and 2008/09. Between 2003/04 and 2007/08 complaints from industry, manufacturing and workshops increased consistently, with a total increase of 25% over the five year period. This trend reversed between 2007/08 and 2008/09 when a decrease of 20% was experienced. This is most likely a direct result of the downturn in the economy.[205]

4.5.2 Sub-regional locations

Plymouth

In Plymouth there is a general decline in noise complaints, although this trend is subject to variation.[206]

The South West Regional Spatial Strategy (RSS) Sustainability Appraisal report identifies a trend of gradual increasing noise pollution within the region. [207]

Research undertaken by the Chartered Institute of Environmental Health and published in 2004 demonstrate that areas of high density housing such as cities and more industrial areas are at most risk of unacceptable noise. The survey revealed that people living in the South Western part of the region are: [208]

- 32% less likely to make a complaint about industrial noise;
- 18% less likely to make a complaint about commercial/leisure noise (although there are 14% more complaints per million population);
- 47% less likely to make a complaint about domestic noise; and

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[204] The Scottish Government, 2009, Noise Complaints, http://www.scotland.gov.uk/Topics/Statistics/Browse/Environment/seso/sesoSubSearch/Q/SID/53
[205] Department of the Environment, 2009, Noise Complaint Statistics for Northern Ireland, http://www.doeni.gov.uk/noise_complaint_statistics_report_for_northern_ireland_200809.pdf
[206] Plymouth's Sustainable Community Strategy 2007-2020, http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm
[207] The South West Regional Spatial Strategy (RSS) Sustainability Appraisal report, http://www.southwest-ra.gov.uk/nqcontent.cfm?a_id=682&tt=swra
[208] Plymouth's Sustainable Community Strategy 2007-2020, http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm

- 35% less likely to make a complaint about construction/demolition noise.

Fife

No information was identified on the overall trend of total noise complaints in Fife. However one of the aim's of Fife Council's Night Time Noise Team (NTNT) which was formed in 2005/06 was to improve the quality of response to those people who suffer from noise disturbance and more than 6,300 complaints were handled by the NTNT in its first 16 months of operation.[209]

4.6 Assessment objective, guide questions and significance

The objective and guide questions related to noise that have been used in the assessment of the effects of the SDP are set out in Table 4.1, together with reasons for their selection.

Table 4.1 Approach to assessing the effects of SDP on topic

Objective/guide question	Reasoning
Objective: Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration.	The SEA Directive requires that the likely significant effects on human health and wellbeing including noise should be taken into account in the Environmental Report
Will the SDP Proposals significantly increase levels of noise and vibration?	Following the Environmental Protection Act 1990 MOD establishments are not allowed to create excessive noise liable to cause a nuisance as part of activities not directly connected with the operation of equipment, training of personnel or other military operations. Noise levels must be within guidelines levels set by WHO in Guideline for community noise and Night noise guidelines for Europe
Will the SDP Proposals affect the amount of noise and vibration felt by local communities?	Target within EU's Sixth Environmental Action Plan (2002-2012) is to achieve reduction of the number of people regularly affected by long-term high noise levels from an estimated 100 million in 2000 by around 10% in 2010, and by 20% in 2020".

Table 4.2 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the noise and vibration objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

[209] Fife Council http://www.fifedirect.org.uk/news/index.cfm?fuseaction=news.display&objectid=8C1A1AB8-A8AB-1C91-DA375BB87C51C54F (accessed 08/06/2011)

Table 4.2 Approach to determining the significance of effects on noise and vibration

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option will cause a significant and sustained decreases in noise levels experienced by local residents living within 250m of the site boundary when compared to those prior to development (>5dB(A)). • Option will cause the number of noise complaints received by the relevant LA concerning site activities to be significantly decreased (reduction greater than 15% year on year).
+	Positive	• Option will cause minor and temporary decreases in noise levels experienced by local residents living within 250m of the site boundary when compared to those prior to development (<5dB(A)). • Option will cause the number of noise complaints received by the relevant LA concerning site activities to be decreased (reduction less than 15% year on year).
0	No (neutral effects)	• Option would not significantly alter noise from current levels and will have no observable effects on local communities.
-	Negative	• Option will cause minor and temporary increase in noise levels experienced by local residents living within 250m of the site boundary when compared to those prior to development (<5dB(A)). • Option will cause minor and temporary increase in noise levels experienced by residents and other sensitive receptors (e.g. birds) living within 50m of any principal transport routes (<5dB(A)). • Option will cause the number of noise complaints received by the relevant LA concerning site activities to be increased (reduction less than 15% year on year).
--	Significant negative	• Option increases noise levels in areas within close proximity (within 100m) of sensitive populations, such that it causes a sustained and significant nuisance that are above statutory levels and would likely generate a considerable number of noise complaints. • Option will cause major and sustained increases in noise levels compared to those prior to development, such that the number of noise complaints received by the relevant LA concerning site activities will be significantly increased (>15% change year on year).
?	Uncertain	• From the level of information available the impact that the option would have on this objective is uncertain.

4.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the noise and vibration objective. **Table 4.3** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 4.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including **management** and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 4.4** below.

Table 4.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than

Category	Assumption Description
	‘greenfield’ sites, although it is recognised that ‘brownfield’ land can be important for conservation and biodiversity. • **‘Existing’, nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the ‘Dock Bottom Village’), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m$^{2.}$ Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2 . As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, ‘greenfield’ site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an ‘existing’ site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct (‘wet’) tow, or a ‘dry’ tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average).

Category	Assumption Description
	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine • It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since recycling a cleared submarine is little different to recycling a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be

Category	Assumption Description
	transported from the initial dismantling facility to the interim storage facility by sea, rail or road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Table 4.3** are considered in-turn below.

Stage I: Design and Develop Initial Submarine Dismantling Facilities

Noise and Vibration

Option 1: Develop a Greenfield Site for Initial Submarine Dismantling

Assessment of Effects:

It is generally assumed that construction of initial dismantling facilities on a greenfield site will significantly increase levels of noise and vibration above the current baseline. Significant sources of on site noise include piling works, earth moving equipment, construction plant, diesel generators, rail traffic and road traffic (HGVs, concrete trucks, forklift trucks, delivery vehicles, vans and personnel vehicles).

Noise disturbance may also arise from sustained high levels of construction traffic (transport of construction materials and construction wastes to and from the site). Assuming that construction traffic would have to use local roads (e.g. lower order, B and C roads) and may pass close to sensitive receptors, it is anticipated that there may be a negative noise effect from construction traffic, particularly HGVs, passing along non-primary routes. However, the exact route(s) would depend on the sites location and extent of local receptors. Activities such as piling works and HGV movements may also cause vibration effects.

Depending on the proximity of sensitive receptors to the site, there would be the potential for noise and vibration associated with construction activities to have an effect on sensitive receptors (occupants of residential buildings, community and recreational facilities and noise sensitive businesses and enterprises).

Effects may also be felt over a longer duration and over a wider area given the need for development of ancillary uses/infrastructure when compared to Options 2 and 3.

Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations.

For RC and RPV options, the specialist facilities needed to package the ILW will not be needed until after interim storage. As the scale of construction would therefore be reduced, it can be assumed that levels of noise and vibration associated with construction activities and HGV movements (which may adversely affect receptors in close proximity to the site and alongside transport networks) will also be less and felt over a shorter duration relative to the Packaged Waste Option (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing development over two periods may serve to keep levels of disturbance below threshold levels where they may have adversely affect sensitive receptors.

Proposed Mitigation / Enhancements Measures:

- Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act, which would give prior consent to carry out certain construction works.
- Limits would typically be taken from British Standard (BS) 5228: 2009, which specifies a limit of 65dB(A) in quiet areas for airborne noise. BS 5228: 2009 contains a large amount of good practice guidance which should be implemented by the contractor, with the aim of reducing any noise and vibration effects on receptors. The noisiest activities should be limited to daytime periods (including deliveries to site). Good practice measures could include the use of acoustic screening to help to reduce off-site noise; selection of plant systems that generate minimum noise levels; enclosure of noisy plant and equipment within buildings or kiosks, if necessary fitted with acoustic panels; considered placement of equipment away from sensitive receptors; and use of 'quiet' (Smart) reversing alarms on vehicles.
- Acceptable levels of noise and vibration at working sites should be defined in Tender documents, which should also require the use of a CEMP and monitored constantly to ensure compliance.
- The use of mains electricity or renewable energy supply in preference to a diesel generator may also help to minimise noise and emissions.
- Traffic movements should be reduced where possible (and the potential to use shipping to move construction materials should be explored).

Stage I: Design and Develop Initial Submarine Dismantling Facilities Noise and Vibration	
Where essential, traffic movements should be controlled by traffic management measures specifying routes and times (e.g. restricting operating hours of large surface vehicles and restricting delivery times to the site).	
Summary: Option 1 has been assessed as having a negative effect in relation to noise and vibration due to the potential for noise disturbance and/or vibration effects from construction activities (e.g. from earth moving equipment, rail transport, HGVs, concrete trucks, forklift trucks, delivery vehicles, vans, personnel vehicles, cranes) required for the redevelopment of a greenfield site. Although expected to be in a more rural location local sensitive receptors may suffer effects of noise and vibration over a longer duration and a wider area due to the scale of construction and increased transport related movements. The potential significance of the effects would depend on the proximity of the site and works to sensitive receptors and the level and extent of noise and vibrations generated. There are sufficient uncertainties at this stage to indicate that there is potential for this assessment to change to a significant negative effect. For RC and RPV options construction of some site components would be delayed. This may reduce both the level and duration of noise and vibration associated with construction activities and HGV movements in the short term relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling to packaged waste.	-
Option 2: Develop Brownfield Site for Initial Submarine Dismantling	
Assessment of Effects: It is generally assumed that construction of initial dismantling facilities on a brownfield site will significantly increase levels of noise and vibration above the current baseline however, it is expected that the potential effects of noise and vibration will be less than that found within Option 1. The level of noise and vibration is dependent on the scale and location of construction activities, given that within a brownfield site it is expected that significant infrastructure and buildings will already be in place from previous uses. Localised noise and vibration effects, similar to any other industrial construction project, will be generated through the use of industrial plant and tools and vehicular movements required to transport materials, equipment and workers to/from site. Significant sources of on site noise include piling works, earth moving equipment, construction plant, diesel generators, rail traffic and road traffic (HGVs, concrete trucks, forklift trucks, delivery vehicles, vans and personnel vehicles). Noise disturbance may also arise from sustained levels of construction traffic (transport of construction materials and construction wastes to and from the site). Assuming that construction traffic would be able to use existing roads developed through previous activities on the brownfield site, it is anticipated that there may be a negative noise effect from construction traffic, however this is expected to be less than under Option 1 due to an anticipated reduction in requirements for construction materials and equipment as well as limited redevelopment of transport routes. It is expected that these potential significant effects are likely to be reversible but may contribute to health effects. The exact route(s) would depend on the sites location and extent of local receptors. Activities such as piling works and HGV movements may also cause vibration effects. Depending on the proximity of sensitive receptors to the site, there would be the potential for noise and vibration associated with construction activities to have an effect on sensitive receptors (occupants of residential buildings, community and recreational facilities and noise sensitive businesses and enterprises). Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the	

Stage I: Design and Develop Initial Submarine Dismantling Facilities Noise and Vibration	
total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV options, the specialist facilities needed to package the ILW will not be needed until after interim storage. As the scale of construction would therefore be reduced, it can be assumed that levels of noise and vibration associated with construction activities and HGV movements (which may adversely affect receptors in close proximity to the site and alongside transport networks) will also be less and felt over a shorter duration relative to the Packaged Waste Option (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing development over two periods may serve to keep levels of disturbance below threshold levels where they may have adversely affect sensitive receptors. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a negative effect in relation to noise and vibration primarily due to the increased levels of construction and associated transport movements required for the redevelopment of a brownfield site. Although construction levels and transport movements are expected to be less than that identified under option 1, local sensitive receptors may still suffer effects of noise and vibration but over a reduced duration and a smaller area due to the reduced scale of construction and transport related movements. For RC and RPV options construction of some site components would be delayed. This may reduce both the level and duration of noise and vibration associated with construction activities and HGV movements in the short term relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling to packaged waste.	-
Option 3: Develop an Existing Licensed/Authorised Site for Initial Submarine Dismantling	
Assessment of Effects: It is generally assumed that construction of initial dismantling facilities on an existing Licensed/Authorised site will increase levels of noise and vibration above the current baseline however it is expected that the potential effects of noise and vibration will be less than that found within Option 1. The level of noise and vibration is dependent on the scale and location of construction activities, given that within an existing Licensed/ Authorised site it is expected that significant infrastructure and buildings will already be in place from existing uses. Localised noise and vibration effects, similar to any other industrial construction project of a similar size, will be generated through the use of industrial plant and tools and vehicular movements required to transport materials, equipment and workers to/from site. Significant sources of on site noise include piling works, earth moving equipment, construction plant, diesel generators, rail traffic and road traffic (HGVs, concrete trucks, forklift trucks, delivery vehicles, vans and personnel vehicles). Noise disturbance may also arise from sustained levels of construction traffic (transport of construction materials and construction wastes to and from the site). Assuming that construction traffic would be able to use existing roads developed through existing activities on the existing licensed authorised site, it is anticipated that there may be a negative noise effect from construction traffic, however this is expected to be less than under Option 1 and possibly even Option 2 due to an anticipated reduction in requirements for construction materials and equipment as it is considered that existing activities on the site will require similar/equivalent infrastructure and services. It is expected that these potential significant effects are likely to be reversible but may contribute to health effects. The exact route(s) would depend on the sites location and extent of local receptors. Activities such as piling works and HGV movements may also cause vibration effects additional to that which occur through standard activities of the site. Depending on the proximity of sensitive receptors to the site, there would be the potential for noise and vibration associated with construction activities to have an effect on sensitive receptors (occupants of the licensed authorised site, residential buildings, community and recreational	

Stage I: Design and Develop Initial Submarine Dismantling Facilities Noise and Vibration	
facilities and noise sensitive businesses and enterprises). Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV options, the specialist facilities needed to package the ILW will not be needed until after interim storage. As the scale of construction would therefore be reduced, it can be assumed that levels of noise and vibration associated with construction activities and HGV movements (which may adversely affect receptors in close proximity to the site and alongside transport networks) will also be less and felt over a shorter duration relative to the Packaged Waste Option (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing development over two periods may serve to keep levels of disturbance below threshold levels where they may have adversely affect sensitive receptors. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a negative effect in relation to noise and vibration primarily due to the reduced levels of construction and associated transport movements required for the development of a dismantling facility on an existing Licensed/Authorised site. Although construction levels and transport movements are expected to be further reduced than that identified under Options 1 and 2 local sensitive receptors may still feel minor effects of noise and vibration but over a considerably reduced duration and a localised area due to the limited scale of construction and transport related movements required. For RC and RPV options construction of some site components would be delayed. This may reduce both the level and duration of noise and vibration associated with construction activities and HGV movements in the short term relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling to packaged waste.	-

Stage II : Design and Develop the Interim ILW Storage Facilities Noise and Vibration	
Option 1: Develop a Greenfield Site for ILW Storage	
Assessment of Effects: Given the generic nature of the construction proposals for the interim storage facility, it assumed that the potential effects associated with this objective will be largely similar as for Stage 1 (construction of the initial dismantling facilities). It is assumed that construction of an interim storage facility on a greenfield site will significantly increase levels of noise and vibration above current levels. Likely sources of on-site noise include piling works, earth moving equipment, construction plant, diesel generators, rail traffic and road traffic (HGVs, concrete trucks, forklift trucks, delivery vehicles, vans and personnel vehicles). Noise disturbance may also arise from sustained high levels of construction traffic (transport of construction materials and construction wastes to and from the site). Assuming that construction traffic would have to use local roads (e.g. lower order, B and C roads) and may pass close to sensitive receptors, Depending on the proximity of sensitive receptors to the site, there would be the potential for noise and vibration associated with construction activities to have an effect on sensitive receptors (occupants of residential buildings, community and recreational facilities and noise sensitive businesses and enterprises). There is potential for a significant negative impact in the short term on local receptors surrounding greenfield sites where there are currently lower ambient noise levels. Effects may also be felt over a longer duration and over a wider area given the need for development of ancillary uses/infrastructure when compared to Options 2 and 3. Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to statutory requirements and Codes of Practice. However, HGV movements could potentially cause a local noise nuisance. **Technical Options:** The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows: • RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas). • RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above. • Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure. Storage of RCs will require construction of a relatively large facility. This reflects both the footprint of the facility and also the requirement for construction of supporting infrastructure. This technical option could therefore result in a greater level and duration of noise and vibration generated through the use of industrial plant and tools and vehicular movements required to transport materials, equipment and workers to/from site during construction. Furthermore, due to the need to transport RC by sea, RC storage facilities would require the construction of a dock further increasing noise and vibration thus creating increased effects on sensitive receptors. Similar effects may also be generated under the RPV option should RPVs be transported by sea. **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of a dismantling facility on a greenfield site).	
Summary: Option 1 has been assessed as having a negative effect in relation to noise and vibration due to the potential for noise disturbance and/or vibration effects from construction activities (e.g. from earth moving equipment, rail transport, HGVs, concrete trucks, forklift trucks, delivery vehicles, vans, personnel vehicles, cranes) required for the redevelopment of a	**-**

Stage II : Design and Develop the Interim ILW Storage Facilities Noise and Vibration	
greenfield site. Although expected to be in a more rural location, local sensitive receptors may suffer effects of noise and vibration over a longer duration and a wider area due to the scale of construction and increased transport related movements. The potential significance of the effects would depend on the proximity of the site and works to sensitive receptors and the level and extent of noise and vibrations generated. There are sufficient uncertainties at this stage to indicate that there is potential for this assessment to change to a significant negative effect. There is potential that development for storage of RCs could result in a greater level and duration of noise and vibration generated through the use of industrial plant and tools and vehicular movements required to transport materials, equipment and workers to/from site during construction. However, development of this scale is not expected to create significant effects related to noise and vibration such that the effects on this aspect of the objective are expected to be minor.	

Option 2: Develop a Brownfield Site for ILW Storage

Assessment of Effects:

It is generally assumed that construction of an interim storage facility on a brownfield site will significantly increase levels of noise and vibration above current however it is expected that the potential effects of noise and vibration will be less than that found within Option 1 due to the assumption that there will be some of the necessary infrastructure already in place.

The level of noise and vibration is dependent on the scale and location of construction activities. There may also be a requirement for the demolition of previous buildings on the site and the remediation of the site (if contaminated).

Localised noise and vibration effects, similar to any other industrial construction project, will be generated through the use of industrial plant and tools and vehicular movements required to transport materials, equipment and workers to/from site. Significant sources of on site noise could include buildings demolition, piling works, earth moving equipment, construction plant, diesel generators, on-site traffic (HGVs, concrete trucks, forklift trucks, delivery vehicles, vans and personnel vehicles).

Noise disturbance may also arise from sustained levels of construction traffic (transport of construction materials and construction wastes to and from the site). The exact route(s) would depend on the sites location and extent of local receptors.

Depending on the proximity of sensitive receptors to the site, there would be the potential for noise and vibration associated with construction activities to have an effect on sensitive receptors (occupants of residential buildings, community and recreational facilities and noise sensitive businesses and enterprises). Given that it is a brownfield site, assumed to be in a semi-urban setting, it is more likely that there will be a range of sensitive human receptors that could be affected (when compared to Option 1). However, it is also likely that background noise levels will be higher.

Technical Options:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

Storage of RCs will require construction of a relatively large facility. This technical option could therefore result in a greater level and duration of noise and vibration generated through the use of industrial plant and tools and vehicular movements required to transport materials, equipment and workers to/from site during construction.

Proposed Mitigation / Enhancements Measures:

- Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to

Stage II : Design and Develop the Interim ILW Storage Facilities Noise and Vibration	
be the same as those proposed for Stage 1 (for construction of a dismantling facility).	
Summary: Option 2 has been assessed as having a negative effect due to the noise and vibration effects from the demolition, remediation, construction and transport movements required for the redevelopment of a brownfield site and the increased likelihood of sensitive receptors being in closer proximity to the site (than in Option 1). Although construction levels and transport movements are expected to be less than that identified under Option 1, local sensitive receptors may still suffer effects of noise and vibration within a smaller area due to the reduced scale of construction and transport related movements. There is potential that development for storage of RCs could result in a greater level and duration of noise and vibration generated through the use of industrial plant and tools and vehicular movements required to transport materials, equipment and workers to/from site during construction, than for RPV and Packaged Waste options. However, development of this scale is not expected to create significant effects related to noise and vibration such that the effects on this aspect of the objective are expected to be minor.	-

Option 3: Develop an Existing Licensed/Authorised Site for ILW Storage

Assessment of Effects:

It is generally assumed that construction of an interim storage facility on an existing Licensed/Authorised site will increase levels of noise and vibration above current however it is expected that the potential effects of noise and vibration will be less than that found within Options 1 and 2 due to the assumption that the majority of the necessary infrastructure will already be in place.

It is assumed that the sources of noise and vibration will be similar to those for Option 2 e.g. building demolition, piling works, earth moving equipment, construction plant, diesel generators, on-site traffic (HGVs, concrete trucks, forklift trucks, delivery vehicles, vans and personnel vehicles). Noise disturbance may also arise from sustained levels of construction traffic (transport of construction materials and construction wastes to and from the site).

It is anticipated that there may be a negative noise effect from construction traffic, however this is expected to be less than under Option 1 and possibly even Option 2 due to an anticipated reduction in requirements for construction materials and equipment

It is assumed that the Licensed/Authorised site will be in an urban setting, and in consequence, it is more likely that there will be a range of sensitive human receptors that could be affected (when compared to Option 1). However, it is also likely that background noise levels will be higher which may make the likelihood of disturbance less, particularly if statutory requirements and Codes of Good Practice are followed.

Technical Options:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar.

Proposed Mitigation / Enhancements Measures:

- Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of a dismantling facility).

Stage II : Design and Develop the Interim ILW Storage Facilities Noise and Vibration	
Summary: Option 3 has been assessed as having a negative effect in relation to noise and vibration. However, construction activities and transport movements are expected to be less intrusive and of shorter duration than those expected to occur under Options 1 and 2. It is assumed that the Licensed/Authorised site will be in an urban setting, and in consequence, it is more likely that there will be a range of sensitive human receptors that could be affected (when compared to Option 1), although ambient noise levels will be higher. There is potential that development for storage of RCs could result in a greater level and duration of noise and vibration as this remains the technical option with the largest amount of construction proposed. However, development of this scale is not expected to create significant effects related to noise and vibration such that the effects on this aspect of the objective are expected to be minor.	**-**

Stage III: Dock Submarines and Remove the Radioactive Materials

Noise and Vibration

Option 1: Reactor Compartment Separation

Assessment of Effects:

The dismantling of a submarine will generate noise and vibration. Separation of the RC from each submarine will require the complete removal of the RC intact from each submarine hull. It is expected that this will require heavy cutting and the use of lifting plant machinery. The extent to which this has an effect on workers, the local community and the surrounding environment will depend on the frequency, duration of timing of such activities along with existing ambient noise levels and the proximity to sensitive receptors (occupants of residential buildings, community and recreational facilities and noise sensitive businesses and enterprises). Increases in noise and vibration may also have a negative effect on species and habitats by, for example, disrupting behaviour.

Compared to Options 2 and 3, this option requires the least processing in the medium term as the RC will be removed 'intact' from the submarine. Through the requirement for separation of the RC, the hull of the submarine will likely be cut in to two sections (fore and aft) to accommodate the removal of the intact RC. This activity is expected to take place in an open environment with limited opportunities for potential for shielding and thus any reduction in potential noise and vibration to the receiving environment. Further noise and vibration is likely to occur under this option through the lift and transfer of the RC to a storage position as well as the anticipated requirement to 'plate and seal' the submarine hull once the RC has been removed to ensure that the hull of the vessel is 'water tight' prior to the submarine being prepared for dismantling post removal of RC. This option therefore, is considered to have a range of potential effects in relation to noise and vibration when compared to the other two options.

As there is second phase of intrusive activity (Stage 6), the potential for disturbance from noise and vibration is prolonged, although separating activities into two phases may also help to minimise any disturbance to local populations. There is also potential for development of alternative techniques during the delay for dismantling to packaged waste, which could further reduce levels of noise and vibration, however, this is very uncertain.

It is considered that noise and vibration from operation will be minimal compared to other stages of the SDP (i.e. – stages 1, 2 and 4) and are expected to be similar to current refit and repair activities. Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely.

Proposed Mitigation / Enhancements Measures:

- Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act
- The use of mains electricity or renewable energy supply in preference to a diesel generator may also help to minimise noise and emissions.
- Limit high noise level generating activities during sensitive periods
- Site specific Environmental Management Plan

Summary: Option 1 has been assessed as having a negative effect on this objective, due to the expected increase in noise and vibration during initial dismantling operations and transportation of equipment, materials and employees. However, it is not expected to be significant. Option 1 will however involve dismantling of the RC to packaged waste after its period of interim storage, causing further noise and vibration in the longer term. This is considered under Stage 6.	**-**

Option 2: Reactor Pressure Vessel Removal

Assessment of Effects:

Under this option the RPV will be removed from the submarine and therefore there would be a greater degree of intrusive activity within the

Stage III: Dock Submarines and Remove the Radioactive Materials Noise and Vibration	
submarine; however, many of these activities occur within the hull structure of the submarine and it remains uncertain whether the activities will be considered more or less disruptive than Option 1. It is considered that there will be more noise and vibration created than under Option 1 in the medium term due to an increase in cut up and processing activities at this stage, thus utilising heavy machinery for longer periods. However, it is considered that although there will be more noise and vibration created under this option the likelihood of this increase in noise and vibration creating further effects than that identified under Option 1 is uncertain. During all associated work towards storage of the RPV and some LLW, there is potential for an increase in noise and vibration which could have a negative effect on the health and wellbeing of the localised workforce and/or communities. However, the probability of any such increases occurring is low given that operational activities will be closely regulated and subject to stringent Health and Safety, Best Available Techniques (BAT) and Environmental Permitting requirements. The RPV will be required to be dismantled to packaged waste at a later stage creating further noise and vibration in the longer term (see Stage 6). There is potential for development of alternative techniques during the delay for cut up, which could further reduce levels of noise and vibration, however, this is very uncertain. For each option, the level of noise nuisance will be dependant on the site selected for dismantling. Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. Depending on the proximity of sensitive receptors to the site, there would be the potential for noise and vibration associated with initial dismantling to have an effect on sensitive receptors (occupants of residential buildings, community and recreational facilities and noise sensitive businesses and enterprises). Operational activities may lead to an increase in noise and vibration which could have a negative effect on certain species and habitats for example, in disrupting behaviour. However, it is considered that noise and vibration from operation will be minimal compared to other stages of the SDP (i.e. – stages 1, 2 and 4) and are expected to be similar to current refit and repair activities. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a negative effect on this objective due to the expected increase in noise and vibration during operations and transportation of equipment, materials and employees although this is not expected to be significant. It is uncertain whether the level of noise and vibration associated with Option 2 is less or greater than that associated with Option 1 due to the potential for a reduction in cut up activities to the hull of the submarine and a potential increase in the dismantling activities which are more likely to be shielded as they are expected to occur within the submarine structure. Option 2 will however involve dismantling of the RPV to packaged waste after its period of interim storage, causing further noise and vibration in the longer term. This is considered under Stage 6.	**-**
Option 3: Reactor Pressure Vessel Removal and Size Reduction for Storage as Packaged Waste	
Assessment of Effects: Option 3 involves removing the RPV, size reducing it and packaging the ILW. Since all the work would be undertaken "up front" this option is likely to lead to further noise and vibration than under Options 1 and 2 in the medium term. However, during associated work towards complete dismantle of the RC in to packaged waste for storage there is potential for much of the activities such as size reduction to be shielded and thus create less potential for the effects of noise and vibration to be felt or heard by sensitive receptors. An increase in noise and vibration could have a negative effect on the health and wellbeing of the localised workforce and/or communities. However, the probability of any such increases occurring is reduced given that operational activities will be closely regulated and subject to stringent Health and Safety, Best Available Techniques (BAT) and Environmental Permitting requirements. This option requires more dismantling and processing than Options 1 and 2 as the RC will be completely processed/dismantled in to packaged waste ready for storage.	

Stage III: Dock Submarines and Remove the Radioactive Materials Noise and Vibration	
Therefore, Option 3 is considered to have a greater level of noise and vibration in the medium term yet with more potential for some activities to be sufficiently shielded and thus reducing the potential level of effect during processing relative to that of Options 1 and 2 with no potential for further noise and vibration in the longer term. Noise disturbance may also arise from increased levels of transportation traffic (transport of ILW/ LLW materials and other wastes to/from the site). Assuming that transportation traffic may have to use local and may pass close to sensitive receptors, it is anticipated that there may be a negative noise effect from traffic, particularly HGVs, passing along non-primary routes. However, the exact route(s) would depend on the sites location and extent of local receptors. Activities such as HGV movements may also cause vibration effects. Operational activities may lead to an increase in noise and vibration which could have a negative effect on certain species and habitats for example, in disrupting behaviour. However, it is considered that noise and vibration from operation will be minimal compared to other stages of the SDP (i.e. – stages 1,2 and 4) and are expected to be similar to current refit and repair activities. Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a negative effect on this objective due to the expected increase in noise and vibration during operations and transportation of equipment, materials and employees**.** The expected increase in noise and vibration during operations and transportation of equipment, materials and employees is expected to be reduced under Option 3 relative to Options 1 and 2 due to activities being undertaken with increased shielding thus reducing the potential effects on local receptors.	**-**

Stage IV: Dismantle the Residual Submarine Hulls, and Process Wastes Noise and Vibration	
All Options	
Assessment of Effects: It is generally assumed that the recycling of a submarine hull will involve activities that will generate considerable levels of noise and vibration at both the initial dismantling facility (during preparatory works) and ship recycling facility, such as heavy cutting of the sections and use of plant lifting machinery. Within the ship recycling facility it is considered that the nature of the works will be similar to that already conducted at the site and therefore levels of noise and vibration and associated effects on local workforce and community are not expected to alter from the current baseline condition at this site. As activities are currently carried out in the initial dismantling facility it is expected that this work will cause a considerable increase in noise and vibration (to a level similar to Stage 3). The risk of these increases in noise negatively affecting the health of the local community and workforce will depend on local topography, atmospheric pressure, prevailing wind direction and proximity to sensitive receptors. However, the probability of any such negative effect is low given that the operational activities will be closely regulated and subject to stringent requirements, including; legislation (the Control of Pollution Act 1974), best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites), Health and Safety and Environmental Permitting. It is expected that the recycling of submarine hulls will require HGV movements to carry plant equipment, waste and recycled materials to and from the dismantling site and the ship recycling site. As the work conducted within the ship recycling facility is considered to be a similar nature to that already carried out on site, it is considered that HGV movements will be of a similar order to those used now and therefore will not have any adverse effects compared to the current baseline. At the initial dismantling site, it may be considered that there will be an overall increase in the total HGV movements and this may increase noise and vibration levels along the transport route. The impact of this will depend upon the routes used and the proximity to sensitive receptors. However, the scale of increase in HGV movements is considered to be relatively small and of a short duration and therefore unlikely to significantly affect noise and vibration. **Proposed Mitigation / Enhancements Measures:** • Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act. • The use of mains electricity or renewable energy supply in preference to a diesel generator may also help to minimise noise and emissions. • Limit high noise level generating activities during sensitive periods. • Site specific Environmental Management Plan. • Consider HGV routes and avoid sensitive receptors and sensitive periods.	
Summary: Preparatory works and ship recycling activities have been assessed as having a largely neutral effect on this objective although there is *potential* for negative effects to arise subject to site location. Whilst noise and vibration is expected to considerably increase at the initial dismantling site compared to current levels, through activities such as cutting and heavy lifting machinery; the risk of this having a significant negative effect on local workforce and community health is considered to be low, given the Environmental Permitting, best practice and Health & Safety requirements that will be in place. There is expected to be increased numbers of HGV movements to and from the initial dismantling site but they are considered to be of a scale unlikely to have a significant effect on noise/vibration levels along transport routes. Although the recycling of submarines and associated HGV movements will produce considerable levels of noise at and the ship recycling facility and along the transport routes to this site, this is considered to be similar to the levels already generated at the site and therefore will not have any negative effects compared to the current baseline.	**0/-**

Stage V: Transport the RC/RPV/ILW to Interim Storage

Noise and Vibration

Option 1: Reactor Compartment Transport to Interim Storage

Assessment of Effects:

The effects of this option (which includes interim ILW storage itself) on noise and vibration depends on how far the RC has to travel. If it is kept at or adjacent to the initial dismantling facility (known as the 'point of waste generation') then effects would be minimal. However, if RCs were taken to another coastal location to be stored, the effects could be more pronounced. This assessment has therefore assessed the impacts of moving the RC offsite to ensure that all potential effects are identified.

Transportation of the RC from the initial dismantling facility to the interim storage facility via sea will involve a number of specific activities that could generate noise. This will include preparation of the RC for transport (with activities such as welding end plates onto the RC), lift and loading onto a sea barge/heavy lift vessel, engine noise from the towing vessel and subsequent unloading of the RC at the interim storage facility. Whether any of these activities give rise to nuisance will depend on the timing of the activities and the proximity to any sensitive receptors. However, given the frequency of movement (of one RC per annum), it is exceptionally unlikely that such effects could be considered significant.

During interim storage there will be minimal maintenance requirements (although these could increase, depending on how long the RC is stored for) and activities will be associated with monitoring and inspection and are generally not expected to generate noise discernible beyond the site.

Furthermore, the number of additional vehicle movements associated to staff, materials and waste is considered to be very low and unlikely to lead to any considerable increase in noise.

Additional maintenance may increase the need of transportation of materials and staff, but this is still expected to be of a very small scale.

Proposed Mitigation / Enhancements Measures:

- Noise levels at the nearest receptors would need to be assessed to confirm that they pose no discernible effect.

Summary: Option 1 has been assessed as having a neutral effect on this objective. Maintenance required during storage will be minimal, generate little noise and there will be minimal associated vehicle movements which therefore is unlikely to impact on this objective.	**0**

Option 2: Reactor Pressure Vessel Transport to Interim Storage

Assessment of Effects:

RPVs may be transported by road, rail or sea. Transportation of the RPV from the initial dismantling facility to the interim store by any of the three available transport options will involve a number of specific activities that could generate noise. This will include preparation of the RPV for transport, lift and loading onto an HGV, rolling stock or a vessel, engine noise from the associated transport option and subsequent unloading of the RPV at the interim storage facility. Whether any of these activities give rise to nuisance will depend on the timing of the activities and the proximity to any sensitive receptors. However, given the frequency of movement (of one RPV per annum), it is exceptionally unlikely that such effects could be considered significant.

During interim storage there will be minimal maintenance requirements (although these could increase, depending on how long the RPV is stored for) and activities will be associated with monitoring and inspection and are generally not expected to generate noise discernible beyond the site.

Furthermore, the number of additional vehicle movements associated to staff, materials and waste is considered to be very low and unlikely to lead to any considerable increase in noise.

Additional maintenance may increase the need of transportation of materials and staff, but this is still expected to be of a very small scale.

<table>
<tr><td colspan="2">Stage V: Transport the RC/RPV/ILW to Interim Storage
Noise and Vibration</td></tr>
<tr><td colspan="2">Proposed Mitigation / Enhancements Measures:
• Noise levels at the nearest receptors would need to be assessed to confirm that they pose no discernible effect.</td></tr>
<tr><td>Summary:
Option 2 has been assessed as having a neutral effect on this objective. The RPV could be transported either by; sea, road or rail. In all cases, only one movement per annum is anticipated. It is considered unlikely that movement by sea will create any additional discernible noise, depending on timing of the movement.
Transport by rail would require a short journey by road to a rail freight handling site, with the RPV being then loaded directly onto a rail bogey. The initial movement from the initial dismantling facility to the rail freight handling facility would be via a heavy lift HGV. The RPV would then be transported to the interim storage facility. At this stage, it is unknown whether the interim storage facility would have a rail head. There may be some short term noise and vibration experienced along the transport route of the heavy lift HGV.
If transportation by road is chosen as the method of transportation then it is anticipated that the RPV will fit on one special heavy lift vehicle. Due to the weight of the RPV and over-pack (>50 tonnes), there may be some short term noise and vibration experienced along the transport route of the heavy lift HGV.
However, as it is envisaged that only one movement per annum of the RPV from the initial dismantling site to the interim storage facility, the effect of any short term increase in noise and vibration is not expected to have any significant negative effect on communities adjoining the transport route.
Maintenance required during storage will be minimal, generate little noise and have minimal associated vehicle movements and therefore is unlikely to impact on this objective.</td><td>0</td></tr>
<tr><td colspan="2">Option 3: Packaged Waste Transport to Interim Storage</td></tr>
<tr><td colspan="2">Assessment of Effects:
Packaged Waste could be transported from the initial dismantling facility to the interim storage facility by either rail or road. If the were transported by road, it would require a heavy load vehicle as the weight of the packaged waste (including an overpack) is anticipated to exceed standard articulated HGV limits. Due to the weight of the packaged waste and overpack, there may be some short term noise and vibration experienced along the transport route of the heavy lift vehicle. As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated disruption on adjacent sensitive receptors, this frequency would not be considered to pose any effect to the local population, under normal operating circumstances.
Packaged waste may also be transported by rail, which would decrease the risk of negative effect further.
Proposed Mitigation / Enhancements Measures:
• Noise levels at the nearest receptors would need to be assessed to confirm that they pose no discernible effect.</td></tr>
</table>

Stage V: Transport the RC/RPV/ILW to Interim Storage Noise and Vibration	
Summary: Option 3 has been assessed as having a neutral effect on this objective. Vehicle movements required for movement of packaged waste are considered to be roughly equivalent to 1 movement every 6.5 weeks which is at a frequency unlikely to impact on this objective. Maintenance required during storage will be minimal, generate little noise and have minimal associated vehicle movements and is unlikely to impact on this objective.	**0**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF

Noise and Vibration

Option 1: Size Reduce the Reactor Compartment and Transfer Packaged Waste to the Proposed GDF

Assessment of Effects:

Depending on where the RCs are stored and where they are to be finally dismantled there may be a requirement to transport RCs prior to dismantling to packaged waste. It is expected that, due to the size and weight of RCs, this will only occur by sea and by barge or heavy lift vessel. Transportation of the RC will involve a number of specific activities that could generate noise. This will include preparation of the RC for transport post storage, lift and loading onto a sea barge, engine noise from the towing vessel and subsequent unloading of the RC. Whether any of these activities give rise to nuisance will depend on the timing of the activities and the proximity to any sensitive receptors. However, given the frequency of movement (of one RC per annum), it is exceptionally unlikely that such effects could be considered significant.

The initial dismantling of the RC will generate noise and vibration. When considering the processing within the initial dismantling of the RC after a period of interim storage it is expected that this will require heavy cutting and the use of heavy lifting machinery. Compared to Options 2 and 3, this option requires the most processing. However, during associated work towards size reduction of the RC into package waste for storage, there is potential for much of the activities to be shielded due to activities being undertaken within the size reduction facility and thus creating less potential for the effects of noise and vibration to be felt or heard by sensitive receptors. The extent to which this has an effect on workers, the local community and the surrounding environment will depend on the frequency, duration of timing of such activities along with existing ambient noise levels and the proximity to sensitive receptors (occupants of residential buildings, community and recreational facilities and noise sensitive businesses and enterprises). Increases in noise and vibration may also have a negative effect on species and habitats by, for example, disrupting behaviour.

As this is second phase of intrusive activity (Stage 3 and initial removal of RC from the rest of the submarine being the first), the potential for disturbance from noise and vibration has been prolonged, although separating activities into two phases may also help to reduce disturbance below thresholds were it may be significant. There is also potential for development of alternative techniques during the delay, which could further reduce levels of noise and vibration, however, this is very uncertain.

It is considered that noise and vibration from operation will be minimal compared to other stages of the SDP (i.e. – stages 1, 2 and 4) and are expected to be similar to refit and repair activities. Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely.

Due to the weight of the packaged waste and overpack, there may be some short term noise and vibration experienced along the transport route of the heavy lift vehicle. As a high end estimate, it is assumed that each container of packaged is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated disruption on adjacent sensitive receptors, this frequency would not be considered to pose any effect to the local population, under normal operating circumstances.

Once the RPV has been removed the remaining RC casing which is expected to be non radioactive will be cut up and size reduced on site. All items removed or size reduced from the RC casing will be monitored, characterised and transferred to a suitable waste processing facility for recycling or disposal as appropriate. It is expected that there will be likely effects associated with this activity such as noise, vibration and potential emissions to air (dust) from cutting activities and transport movements and are expected to be of a similar nature to other activities undertaken on a ship recycling facility. However, it is uncertain as to where the cut up and size reduction of the RC casing will take place within the SDP site and subsequently the level of shielding that will be provided. The scale of effect of this activity is therefore uncertain at this point.

Proposed Mitigation / Enhancements Measures:

- Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act
- The use of mains electricity or renewable energy supply in preference to a diesel generator may also help to minimise noise and emissions.
- Limit high noise level generating activities during sensitive periods
- Site specific Environmental Management Plan

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Noise and Vibration	
Summary: Option 1 has been assessed as having a negative effect on this objective, due to the expected increase in noise and vibration during initial dismantling (deplanting and extraction of RPV) and size reduction operations and transportation of equipment, materials and employees. However, although a significant amount of this work will be undertaken in an unshielded location it is still not expected to be significant. Option 1 will also involve the transportation of packaged waste to the proposed GDF after the period of interim storage with a potential of 1 HGV movement every six weeks on the basis of the dismantling of one submarine per year.	-
Option 2: Size Reduce the Reactor Pressure Vessel and Transfer Packaged Waste to the Proposed GDF	
Assessment of Effects: Under this option, the RPV will have previously been removed from the submarine during Stage 3 and placed into interim storage prior to final dismantling to packaged waste. When considering the transportation of the RPV to the size reduction facility it is expected, regardless of transportation option, that there will be associated noise and vibration effects. The RPV is expected to be transported from the interim storage facility to the size reduction facility either by sea, rail or road. At this time it is uncertain as to the distance between the two facilities and therefore the level of effects is uncertain. There is expected to be a degree of intrusive activity when undertaking size reduction of the RPV, with potential for noise and vibration, however it is considered that these activities will occur within the size reduction facility thus providing shielding from the effects of noise and vibration. It is therefore likely that the activities under Option 2 will be considered less disruptive than Option 1. It is considered that there will be less noise and vibration created than under Option 1 in the medium term due to a reduction in cut up and processing activities at this stage, thus utilising heavy machinery for shorter periods. However it is considered that although there will be less noise and vibration created under this option, the likelihood of this reduction in noise and vibration creating lesser effects than that identified under Option 1 is uncertain. Further, it is expected that due to the differing scale and weight of the RPV to RC there is likely to a potential reduction in noise and vibration in comparison to that identified within Option 1 in relation to the lift and transfer from interim storage stage of this option. During all associated work towards size reduction of the RPV, there is potential for an increase in noise and vibration, which could have a negative effect on the health and wellbeing of the localised workforce and/or communities. However, the probability of any such increases occurring is low given that operational activities will be closely regulated and subject to stringent Health and Safety, Best Available Techniques (BAT) and Environmental Permitting requirements. As the RPV will be dismantled to packaged waste during this stage, this will split the intrusive activities across two time periods (initial dismantling being undertaken during Stage 3) and the creation of potential noise and vibration will have been prolonged. However, separating activities into two phases may also help to reduce disturbance below thresholds where they could be harmful. There is also potential for development of alternative techniques during the delay, which could further reduce levels of noise and vibration, however, this is very uncertain. Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. Depending on the proximity of sensitive receptors to the site, there would be the potential for noise and vibration associated with dismantling to have an effect on sensitive receptors (occupants of residential buildings, community and recreational facilities and noise sensitive businesses and enterprises). Operational activities may lead to an increase in noise and vibration which could have a negative effect on certain species and habitats for example, in disrupting behaviour. However, it is considered that noise and vibration from operation will be minimal compared to other stages of the SDP (i.e. – stages 1, 2 and 4) and are expected to be similar to current refit and repair activities. Due to the weight of the packaged waste and over-pack, there may be some short term noise and vibration experienced along the transport route of the heavy lift vehicle. As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated disruption on adjacent sensitive receptors, this frequency would not be considered to pose any effect to the local population, under normal operating	

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Noise and Vibration	
circumstances. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1. .	
Summary: Option 2 has been assessed as having a negative effect on this objective due to the expected increase in noise and vibration during operations and transportation of equipment, materials and employees although is not expected to be significant in the medium to long term. It is expected that the level of noise and vibration associated with Option 2 would be less than that associated with Option 1 as the RPV will have already been removed and subsequent size reduction activities would be shielded as they are expected to occur within the size reduction facility, thus reducing the effects on local receptors. Option 2 will also involve the transportation of packaged waste to the proposed GDF after the period of interim storage with a potential of 1 HGV movement every six weeks on the basis of the dismantling of one submarine per year.	**0/-**
Option 3: Transport Packaged Waste to the Proposed GDF	
Assessment of Effects: Under this option all dismantling and packaging activities will have been undertaken up front and consequently any noise and vibration effects at this stage would relate to transporting the packaged waste to the proposed GDF only. Due to the weight of the packaged waste and overpack, there may be some short term noise and vibration experienced along the transport route of the heavy lift vehicle. As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated disruption on adjacent sensitive receptors, this frequency would not be considered to pose any effect to the local population, under normal operating circumstances. There is the potential for packaged waste to be moved at a higher frequency of movement than equivalent to 1 submarine per annum, as packaged waste requires no further processing prior to transportation to the proposed GDF however the scale of effects created by changing the frequency of movement of packaged waste is uncertain as there are many determinants such as number of over packs available, proposed GDF availability to receive frequency of packaged waste and the mode of transport to be used. If all packaged waste was to be moved over the period of 1 year with 2 overpacks, transport movements would occur approximately 4 times per week thus increasing the frequency of effects under this objective, although not significantly. Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a neutral effect on this objective due to the expected limited increase in noise and vibration during transportation of packaged waste to the proposed GDF after the period of interim storage. With a potential of one HGV movement every four weeks this increase in noise and vibration is expected to be significantly less than that identified within Options 1 and 2. However as identified within the assessment if this frequency of movements was to increase there is potential for adverse effect.	**0**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Noise and Vibration

Stage VII: Decommission SDP Facilities

Noise and Vibration

Option 1: Decommission Greenfield Sites

Assessment of Effects:

It is generally assumed that decommissioning and demolition of initial dismantling, size reduction and interim storage facilities constructed on a greenfield site will increase levels of noise and vibration during the decommissioning stage above that experienced during the operating stages on site. Significant sources of on site noise include demolition works, earth moving equipment, plant, diesel generators, rail traffic and road traffic (HGVs, aggregate trucks, forklift trucks, delivery vehicles, vans and personnel vehicles). It is assumed that all/most of the infrastructure and ancillary facilities as well as the dismantling/size reduction and storage facilities will be required to be demolished, including but not restricted to; docks, rail head, roads, cranes, and admin offices. Furthermore, in order to restore the land to its original greenfield state, all hardstanding will need to be removed increasing the levels of land excavation required relative to Options 2 and 3.

Noise disturbance may also arise from sustained high levels of demolition traffic (transport of demolition wastes from the site). Activities such as demolition and deconstruction works and HGV movements may also cause vibration effects. Depending on the proximity of sensitive receptors to the site, there would be the potential for noise and vibration associated with demolition activities to have an effect on sensitive receptors (occupants of residential buildings, community and recreational facilities and noise sensitive businesses and enterprises).

Effects are likely to be felt over a long duration given the need for development of ancillary uses/infrastructure to support the segregation, management and packaging of ILW and LLW from the structure and fabric of the SDP facilities and associated buildings. Further to this, it is expected that when decommissioning a greenfield site, all transport links that have been developed and/or enhanced for the purposes of the SDP facilities will also be required to be restored to background, hence effects are likely to be felt over a wide area.

Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely.

Following restoration of the site, operational activities (and associated noise and vibration effects) will cease returning noise levels similar to those prior to development.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim ILW storage facility compared to RPV and Packaged Waste options and, on a greenfield site, removal of docking facilities would also be required. Consequently, it is assumed that the scale and potential significance of noise and vibration associated with this technical option would also be greater (due to a higher volume of demolition traffic and additional noise generated from the extended use of plant equipment).

Proposed Mitigation / Enhancements Measures:

- Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act, which would give prior consent to carry out certain demolition works.
- Limits would typically be taken from British Standard (BS) 5228: 2009, which specifies a limit of 65dB(A) in quiet areas for airborne noise. BS 5228: 2009 contains a large amount of good practice guidance which should be implemented by the contractor, with the aim of reducing any noise and vibration effects on receptors. The noisiest activities should be limited to daytime periods (including deliveries to or removals from site). Good practice measures could include the use of acoustic screening to help to reduce off-site noise; selection of plant systems that generate minimum noise levels; enclosure of noisy plant and equipment within buildings or kiosks, if necessary fitted with acoustic panels; considered placement of equipment away from sensitive receptors; and use of ‘quiet’ (Smart) reversing alarms on vehicles.
- Acceptable levels of noise and vibration at working sites should be defined in Tender documents, which should also require the use of an EMP and monitored constantly to ensure compliance.

Stage VII: Decommission SDP Facilities Noise and Vibration	
• The use of mains electricity or renewable energy supply in preference to a diesel generator may also help to minimise noise and emissions. • Traffic movements should be reduced where possible (and the potential to use shipping to move demolition materials/wastes should be explored). Where essential, traffic movements should be controlled by traffic management measures specifying routes and times (e.g. restricting operating hours of large surface vehicles and restricting delivery times to the site).	
Summary: Option 1 has been assessed as having a long term positive effect in relation to noise and vibration as, once sites have been cleared, it is expected that noise levels will reduce and return back to background levels found on site prior to development. However, it is recognised that in the short to medium term there will be increased noise disturbance and/or vibration effects from the demolition activities (e.g. from earth moving equipment, rail transport, HGVs, trucks, delivery vehicles, vans, personnel vehicles, cranes). Local sensitive receptors may suffer effects of noise and vibration over a longer duration and a wider area compared to Options 2 and 3 due to the scale of demolition and increased transport related movements. The potential significance of the effects would depend on the proximity of the site and works to sensitive receptors and the level and extent of noise and vibrations generated. The severity of noise and vibration associated with the decommissioning of the interim storage facility will be dependent on the technical option taken forward. In this respect, the RC option will require decommissioning of a relatively large interim storage facility which would increase the potential for adverse effects related to decommissioning works and HGV movements relative to the RPV and Packaged Waste options.	**-/+**
Option 2: Decommission Brownfield Sites	
Assessment of Effects: It is generally assumed that decommissioning and demolition of initial dismantling, size reduction and interim storage facilities constructed on a brownfield site will increase levels of noise and vibration during the decommissioning stage above that experienced during the operating stages on site. However, it is expected that the potential effects of noise and vibration will be less than that found within Option 1 as significant infrastructure and buildings will be left 'in situ' where appropriate (thereby reducing the scale of activity which may generate noise and vibration). Localised noise and vibration effects, similar to any other industrial demolition project, will be generated through the use of industrial plant and tools and vehicular movements required to transport waste materials, equipment and workers to/from site. Significant sources of on site noise include, earth moving equipment, demolition plant, diesel generators, rail traffic and road traffic (HGVs, cranes, forklift trucks, delivery vehicles, vans and personnel vehicles). Noise disturbance may also arise from sustained levels of demolition traffic (transport of materials and construction demolition wastes to and from the sites). Assuming that demolition traffic will use existing roads developed through previous activities on the brownfield site, it is anticipated that there may be a negative noise effect from demolition traffic, however this is expected to be less than under Option 1 due to an anticipated reduction in requirements for demolition equipment as well as limited demolition of transport routes. Given the reduced demolition and land excavation required under Option 2 it is expected that decommissioning will generate less general waste than for Option 1. This will also reduce the volumes of waste transported off site for disposal (although it is expected that ILW and LLW volumes will remain the same across the land use options). This, along with the reduced need for movement of staff and equipment, will decrease the total number of vehicle movements and associated noise emissions. Activities such as earth moving works and HGV movements may also cause vibration effects. Depending on the proximity of sensitive receptors to the site, there would be the potential for noise and vibration associated with demolition and decommissioning activities to have an effect on sensitive receptors (occupants of residential buildings, community and recreational facilities and noise sensitive businesses and enterprises). Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely.	

Stage VII: Decommission SDP Facilities Noise and Vibration	
Following restoration of the site, operational activities (and associated noise and vibration effects) will cease returning noise levels similar to those prior to development. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. RC storage will require decommissioning of a relatively large interim ILW storage facility compared to RPV and Packaged Waste option. Consequently, it is assumed that the scale and potential significance of noise and vibration associated with this technical option would also be greater (due to a higher volume of demolition traffic and additional noise generated from the extended use of plant equipment). **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: Option 2 has been assessed as having a long term positive effect in relation to noise and vibration as, once sites have been cleared, it is expected that noise levels will reduce and return back to background levels found on site prior to development. However, it is recognised that in the short to medium term there will be increased noise disturbance and/or vibration effects from the demolition activities (e.g. from earth moving equipment, rail transport, HGVs, trucks, delivery vehicles, vans, personnel vehicles, cranes). Although expected to be in a semi urban location, local sensitive receptors may suffer effects of noise and vibration over a shorter duration and a reduced area due to the scale of demolition and increased transport related movements in comparison to that identified under Option 1. The potential significance of the effects would depend on the proximity of the site and works to sensitive receptors and the level and extent of noise and vibrations generated. The severity of noise and vibration associated with the decommissioning of the interim storage facility will be dependent on the technical option taken forward. In this respect, the RC option will require decommissioning of a relatively large interim storage facility which would increase the potential for adverse effects related to decommissioning works and HGV movements relative to the RPV and Packaged Waste options.	**-/+**
Option 3: Decommission Existing Licensed/Authorised Sites	
Assessment of Effects: It is generally assumed that decommissioning and demolition of dismantling, size reduction and interim storage facilities constructed on an Existing Licensed/Authorised site will increase levels of noise and vibration during the decommissioning stage above that experienced during the operating stage of the facilities. However, it is expected that the potential effects of noise and vibration will be less than that found within Options 1 and 2 as it is expected that significant infrastructure and buildings may be left ‘in situ’ where appropriate (thereby reducing the scale of activity which may generate noise and vibration). Localised noise and vibration effects, similar to any other industrial demolition project, will be generated through the use of industrial plant and tools and vehicular movements required to transport waste materials, equipment and workers to/from site. Significant sources of on site noise include, earth moving equipment, plant, diesel generators, rail traffic and road traffic (HGVs, cranes, forklift trucks, delivery vehicles, vans and personnel vehicles). Noise disturbance may also arise from sustained levels of demolition traffic (transport of demolition wastes to and from the site). Assuming that demolition traffic would be able to use existing roads developed through existing activities on the existing licensed authorised site, it is anticipated that there may be a negative noise effect from demolition traffic, however this is expected to be less than under Option 1 and possibly even Option 2. The exact route(s) would depend on the sites location and extent of local receptors.	

Stage VII: Decommission SDP Facilities Noise and Vibration	
Depending on the proximity of sensitive receptors to the site, there would be the potential for noise and vibration associated with demolition activities to have an effect on sensitive receptors (occupants of the licensed authorised site, residential buildings, community and recreational facilities and noise sensitive businesses and enterprises). Whilst activities on site would generate noise and vibration, any effects from on site noise would probably not be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228: 2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. Following restoration of the site, operational activities (and associated noise and vibration effects) will cease returning noise levels similar to those prior to development. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence of the technical options on their severity is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: Option 3 has been assessed as having a long term positive effect in relation to noise and vibration as, once sites have been cleared, it is expected that noise levels will reduce and return back to background levels found on site prior to development. However, it is recognised that in the short to medium term there will be increased noise disturbance and/or vibration effects from the demolition activities (e.g. from earth moving equipment, rail transport, HGVs, trucks, delivery vehicles, vans, personnel vehicles, cranes). Although demolition levels and transport movements are expected to be further reduced than that identified under Options 1 and 2 local sensitive receptors may still feel minor effects of noise and vibration but over a considerably reduced duration and a localised area due to the limited scale of construction and transport related movements required. The severity of noise and vibration associated with the decommissioning of the interim storage facility will be dependent on the technical option taken forward. In this respect, the RC option will require decommissioning of a relatively large interim storage facility which would increase the potential for adverse effects related to decommissioning works and HGV movements relative to the RPV and Packaged Waste options.	**-/+**

4.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the noise and vibration objective. **Box 4.2** provides a summary of the options that have been assessed.

Box 4.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 4.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration.	-	-	-	**Potential Effects** Modifications to and the construction of new SDP facilities, and submarine dismantling and segregation/size reduction activities at the Devonport and Rosyth dockyards would increase noise and vibration above current levels at the dockyards. Significant sources of on-site noise and vibration include piling works, earth moving equipment, plant and diesel generators and traffic (HGVs, concrete trucks, forklift trucks, delivery vehicles, vans and personnel vehicles). Initial dismantling (RC cut out) is anticipated to require heavy cutting and the use of lifting plant machinery. Activities such as piling works may also cause vibration effects. There is the potential for noise and vibration associated with SDP activities within the dockyards to impact on sensitive receptors (SDP workers, occupants of the dockyard, residential buildings, community and recreational facilities, and noise sensitive businesses and enterprises), wildlife and historic buildings *(refer to impacts specific to the Devonport and Rosyth dockyards).*
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	-	-	-	The extent to which noise and vibration from SDP operational activities has an effect on workers, the local community and the surrounding environment depends on the frequency, duration of timing of such activities along with existing ambient noise levels and the proximity to sensitive receptors. Use of industrial plant and tools has the potential to generate localised occupational noise levels which may have health and safety implications for SDP workers. However, statutory construction health and safety requirements will require noise minimisation and appropriate safety equipment to be used, including the use of ear defenders and thus would protect workers from noise and vibration. As the Devonport and Rosyth dockyards are operational dockyards and assuming that SDP activities would take place within the nuclear licensed site in the dockyards away from sensitive receptors, noise disturbance to local communities is expected to be minor. Whilst activities on-site would generate noise and vibration any effects are not anticipated to be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228:2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. Traffic movements to and from the dockyards (transport of construction materials, general wastes, LLW and ILW to and from the dockyards), particularly HGVs, passing along non-primary routes e.g. lower order, B and C roads) may elevate noise levels adjoining local transport networks *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, traffic movements associated with SDP activities are unlikely to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)), and therefore any noise disturbance from traffic is anticipated to be minor. Depending on submarine transport methods (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used) there is the potential for noise disturbance from any dredging or channel modifications *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, it is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required. Transportation of submarines to and from the dockyards would involve a number of specific activities that could generate noise, in particular the preparation of the hull for transport following RC removal (with activities such as welding end plates onto the fore and aft sections of the hull). Whether any of these activities give rise to nuisance would depend on the timing of the activities and the proximity to sensitive receptors. However, given the frequency of movement (of one submarine per annum), it is unlikely that such effects could be considered significant. Interim storage is expected to be a relatively passive activity involving monitoring and

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				inspection, and therefore is unlikely to generate noise discernible beyond the sites. Of the technical options, taking account of interim storage requirements the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2 and, in consequence, any noise and vibration during construction could be greater. Notwithstanding this, in the case of the RC option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation and size reduction of the RC would not take place until the interim storage period is nearing completion. Separating activities into two phases may help to minimise disturbance and any negative effects on local communities. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur. Although in the case of all of the technical options, no significant noise and vibration impacts are anticipated.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	-	-	-	The RC option requires the least processing at the initial dismantling stage, as the RC would be separated 'intact' from the submarine. This would involve cutting the hull of the submarine into two sections (fore and aft) to enable the removal of the intact RC. This activity is expected to take place in an open environment with limited opportunities or potential for shielding and thus any reduction in potential noise and vibration to the receiving environment. Further noise and vibration is likely to occur under this option through the lift and transfer of the RC to storage and subsequently back into the DBV following interim storage for RPV removal, as well as the anticipated requirement to 'plate and seal' the fore and aft sections of the submarine hull once the RC has been removed for transportation to the commercial ship recycling facility. This option is therefore considered to have a range of potential effects in relation to noise and vibration when compared to the other technical options. There is the potential for development of alternative techniques during the delay for RPV removal and size reduction, which could reduce levels of noise and vibration; however, this is very uncertain. <u>Devonport Dockyard</u> Major sources of noise in Plymouth include domestic sources, traffic and construction. Plymouth City Airport and Moorcroft Quarry (both on the eastern edge of Plymouth) are also a major source of noise. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Current noise levels at Devonport dockyard are unknown. However, noise surveys undertaken to inform the development of land to the north of Devonport dockyard (undertaken at a location representative of properties on Savage Gardens, Wolseley Road and Hamoaze Avenue) determined that during the daytime the ambient noise (L_{Aeq}) was in the range of 47-51 dB(A) and during the nighttime ambient noise was in the range of 41-42 dB(A) . The noise climate at the time of monitoring was dockyard by general noise from the dockyard and occasional mobile plant activities. Taking account of the scale and nature of the activities to be undertaken, which would be similar to existing activities currently being undertaken at the dockyard, which includes base porting, refitting, defuelling and decommissioning Royal Navy submarines, maintenance of the Royal Navy's surface ship fleet, along with some commercial ship building and maintenance, there is not anticipated to be a significant increase in noise and vibration

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				above current levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities noise and vibration disturbance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)). There are 5 scheduled monuments in the Devonport dockyard (4 in South Yard and 1 in Bull Point). In addition, there are 85 listed buildings, predominantly in South Yard and Bull Point. There is the potential for noise and vibration from SDP activities to indirectly impact on these assets, although assuming that SDP activities take place within the nuclear licensed site away from these assets and given the scale of development required and the activities to be undertaken, no significant impacts on these heritage assets are anticipated.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	-	-	-	As noise and vibration from SDP activities would be localised and assuming that SDP activities would take place within the nuclear licensed site at Devonport dockyard away from wildlife habitats, limited disturbance to wildlife as a result of noise and vibration is anticipated. There is the potential for any construction works close to the basins to impact upon fish populations in the basins; noise levels close to a percussion pile driver (within about 5m) can exceed the levels that will harm or kill fish. However, no significant upgrades or alterations to the dock structures are anticipated to be required. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into the dockyard and this is expected to be the preferred method of transportation. Submarine sections can be transported to the commercial ship recycling facility following initial dismantling in a variety of ways including heavy lift vessel (although this is considered to be the least likely transport option to be implemented), submersible barge or tow (following welding to ensure that they are watertight). In the unlikely event that a heavy lift vessel is used to transport submarines to the dockyard or fore and aft sections to the commercial ship recycling facility, there is potential for dredging required to accommodate heavy lift operations, which is often undertaken over 24 hours, to result in noise disturbance to local communities along the estuary waterfront (e.g. noise from the dredger engine and suction pumps). Noise and vibration from dredging and channel modification could also impact on marine mammals sensitive to sound (e.g. limiting the detection by the mammals of natural sound, disturbing their normal behaviour resulting in possible displacement from areas, or causing reductions in hearing sensitivity); it is noted that the Plymouth Sound & Estuaries SAC supports dolphin and porpoise (both Annex II species). Notwithstanding this, any such impacts are expected to be limited to the duration of the channel modification and dredging and any effects are not anticipated to be significant due to the need to adhere to the requirements of legislation. Although dolphins and porpoises have been sighted Plymouth Sound, sightings are infrequent indicating that these species are infrequent visitors to the estuary and such as the potential for impacts on these species is not considered to be significant. Rosyth Dockyard Major sources of noise in Fife include traffic, particularly the A90 north of the Forth Bridge to the east of Rosyth dockyard. Noise pollution caused by the growth in road transport and congestion is a key issue. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Current noise levels at Rosyth dockyard are unknown. However, noise surveys undertaken to inform the development of land to the east of Rosyth dockyard determined that during the daytime the ambient noise (L_{Aeq}) is in the range of 48-65 dB(A), depending on the proximity to local through roads. Background noise levels (L_{A90}) during the day generally range from 45-51 dB(A). During the night the range of mean background LA90 noise levels between the receptors is relatively narrow at 37.1-39.5 dB(A).

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				Taking account of the scale and nature of the activities to be undertaken, which would be similar to existing activities currently being undertaken at the dockyard, which includes maintenance of the Royal Navy's surface ship fleet and aircraft carrier assembly, is there not anticipated to be a significant increase in noise and vibration above current levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities noise and vibration disturbance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)).
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	-	-	-	There are 2 listed buildings within Rosyth dockyard (the Grade B listed power station and pumping station), both of which are located in the nuclear licensed site within the dockyard. There is the potential for noise and vibration from SDP activities to indirectly impact on these assets, although given the scale of development required and the activities to be undertaken, no significant impacts on these heritage assets are anticipated. As noise and vibration from SDP activities would be localised and assuming that SDP activities would take place within the nuclear licensed site at Rosyth dockyard away from wildlife habitats, limited disturbance to wildlife as a result of noise and vibration is anticipated. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any noise and vibration impacts associated with dredging. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Should heavy lift vessels be used to transport submarines to the dockyard and/or fore and aft sections to the commercial ship recycling facility there may also be a requirement for significant dredging of the estuary by Devonport dockyard to accommodate heavy lift operations, resulting in additional noise and vibration impacts when compared to Rosyth dockyard. However, it is expected that viable alternatives will be implemented ahead of heavy lift (e.g. wet tow) such that dredging is unlikely to be required. Devonport dockyard is located in the city of Plymouth in a built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards and the scale of development required, there is considered to be a greater potential for noise and vibration disturbance from SDP activities at Devonport dockyard when compared to Rosyth dockyard, as fewer sensitive receptors could be affected at Rosyth dockyard, although noise and vibration disturbance as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be minor. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for noise and vibration from transport of LLW from Plymouth to impact on local communities adjoining local transport networks along the LLW transport route. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				road networks, and the timescales over which LLW would be transported off-site, any noise and vibration impact from LLW transport is anticipated to be negligible. Although traffic from Rosyth dockyard may route on to the A90 to the east of the dockyard, which is a major source of noise in Fife, any traffic generated as a result of SDP activities is not anticipated to have a significant effect on noise levels attributed to traffic flows along this route.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	-	-	-	<u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both dockyards for dismantling would enable faster initial dismantling of the existing laid-up submarines, reducing the timescale of any noise and vibration impacts associated with dismantling activities. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be de-fuelled, which would reduce any noise and vibration impacts associated with submarine transportation.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	-	-	-	The extent to which noise and vibration from SDP activities has an effect on workers, the local community and the surrounding environment depends on the frequency, duration of timing of such activities along with existing ambient noise levels and the proximity to sensitive receptors. Use of industrial plant and tools has the potential to generate localised occupational noise levels which may have health and safety implications for SDP workers. However, statutory construction health and safety requirements will require noise minimisation and appropriate safety equipment to be used, including the use of ear defenders and thus would protect workers from noise and vibration. As the Devonport and Rosyth dockyards are operational dockyards and assuming that SDP activities would take place within the nuclear licensed site in the dockyards away from sensitive receptors, noise disturbance to local communities is expected to be minor. Whilst activities on-site would generate noise and vibration any effects are not anticipated to be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228:2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. Traffic movements to and from the dockyards (transport of construction materials, general wastes, LLW and ILW to and from the dockyards), particularly HGVs, passing along non-primary routes e.g. lower order, B and C roads) may elevate noise levels adjoining local transport networks *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, traffic movements associated with SDP activities are unlikely to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)), and therefore any noise disturbance from traffic is anticipated to be minor. Depending on submarine transport methods (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used) there is the potential for noise disturbance from any dredging or channel modifications *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, it is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required. Transportation of submarines to the dockyards would involve a number of specific activities that could generate noise, in particular the preparation of the hull for transport following RPV removal (with activities such as welding plates onto the hull). Whether any of these activities give rise to nuisance would depend on the timing of the activities and the proximity to sensitive receptors. However, given the frequency of movement (of one submarine per annum), it is unlikely that such effects could be considered significant. Interim storage is expected to be a relatively passive activity involving monitoring and inspection, and therefore is unlikely to generate noise discernible beyond the sites. Of the technical options, taking account of the scale of development required for the RPV option would be smaller than the other options, with the RPV option requiring a new ILW storage area with a footprint of 801m^2 and, in consequence, any noise and vibration during construction could be less. In addition, in the case of the RPV option the construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for segregation and size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases may help to minimise disturbance and any negative effects on local communities. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extendedtime period over which effects could occur. Although in the case of all of the technical options, no significant noise and vibration impacts are anticipated.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	-	-	-	The RPV option involves the cutting of the hull of the submarine and the removal of RC components to enable the removal of the intact RPV. It is anticipated that there would be more noise and vibration during initial dismantling for the RPV option when compared to the equivalent initial phase of the RC option, due to an increase in processing activities at this stage, which would also require use of heavy machinery for longer periods. Subsequent activities associated with storage of the RPV and processing of the ILW arising during dismantling would result in further noise impacts. There is the potential for development of alternative techniques during the delay for RPV removal and size reduction, which could further reduce levels of noise and vibration; however, this is very uncertain. <u>Devonport Dockyard</u> Major sources of noise in Plymouth include domestic sources, traffic and construction. Plymouth City Airport and Moorcroft Quarry (both on the eastern edge of Plymouth) are also a major source of noise. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Current noise levels at Devonport dockyard are unknown. However, noise surveys undertaken to inform the development of land to the north of Devonport dockyard (undertaken at a location representative of properties on Savage Gardens, Wolseley Road and Hamoaze Avenue) determined that during the daytime the ambient noise (LAeq) was in the range of 47-51 dB(A) and during the nighttime ambient noise was in the range of 41-42dB(A). The noise climate at the time of monitoring was dockyard by general noise from the dockyard and occasional mobile plant activities. Taking account of the scale and nature of the activities to be undertaken, which would be similar to existing activities currently being undertaken at the dockyard, which includes base porting, refitting, defuelling and decommissioning Royal Navy submarines, maintenance of the Royal Navy's surface ship fleet, along with some commercial ship building and maintenance, is there not anticipated to be a significant increase in noise and vibration above current levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities noise and vibration disturbance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)). There are 5 scheduled monuments in the Devonport dockyard (4 in South Yard and 1 in Bull Point). In addition, there are 85 listed buildings, predominantly in South Yard and Bull Point. There is the potential for noise and vibration from SDP activities to indirectly impact on these assets, although assuming that SDP activities take place within the nuclear licensed site away from these assets and given the scale of development required and the activities to be undertaken, no significant impacts on these heritage assets are anticipated.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise	-	-	-	As noise and vibration from SDP activities would be localised and assuming that SDP activities would take place within the nuclear licensed site at Devonport dockyard away from wildlife habitats, limited disturbance to wildlife as a result of noise and vibration is anticipated. There is the potential for any construction works close to the basins to impact upon fish populations in the basins; noise levels close to a percussion pile driver (within about 5m) can exceed the levels that will harm or kill fish. However, no significant upgrades or alterations to the dock structures are anticipated to be required. Based on current known information it is understood that the channel arrangements at

Assessment Criteria	Score			Commentary
	2D	2R	2B	
and vibration. *(continued)*				Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation. Rosyth Dockyard Major sources of noise in Fife include traffic, particularly the A90 north of the Forth Bridge to the east of Rosyth dockyard. Noise pollution caused by the growth in road transport and congestion is a key issue. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Current noise levels at Rosyth dockyard are unknown. However, noise surveys undertaken to inform the development of land to the east of Rosyth dockyard determined that during the daytime the ambient noise (L_{Aeq}) is in the range of 48-65 dB(A), depending on the proximity to local through roads. Background noise levels (L_{A90}) during the day generally range from 45-51 dB(A). During the night the range of mean background LA90 noise levels between the receptors is relatively narrow at 37.1-39.5 dB(A). Taking account of the scale and nature of the activities to be undertaken, which would be similar to existing activities currently being undertaken at the dockyard, which includes maintenance of the Royal Navy's surface ship fleet and aircraft carrier assembly, is there not anticipated to be a significant increase in noise and vibration above current levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities noise and vibration disturbance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)). There are 2 listed buildings within Rosyth dockyard (the Grade B listed power station and pumping station), both of which are located in the nuclear licensed site within the dockyard. There is the potential for noise and vibration from SDP activities to indirectly impact on these assets, although given the scale of development required and the activities to be undertaken, no significant impacts on these heritage assets are anticipated.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	-	-	-	As noise and vibration from SDP activities would be localised and assuming that SDP activities would take place within the nuclear licensed site at Rosyth dockyard away from wildlife habitats, limited disturbance to wildlife as a result of noise and vibration is anticipated. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any noise and vibration impacts associated with dredging. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. . Devonport dockyard is located in the city of Plymouth in a built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards and the scale of development required, there is considered to be a greater potential for noise and vibration

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				disturbance from SDP activities at Devonport dockyard when compared to Rosyth dockyard, as fewer sensitive receptors could be affected at Rosyth dockyard, although noise and vibration disturbance as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be minor. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for noise and vibration from transport of LLW from Plymouth to impact on local communities adjoining local transport networks along the LLW transport route. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any noise and vibration impact from LLW transport is anticipated to be negligible. Although traffic from Rosyth dockyard may route on to the A90 to the east of the dockyard, which is a major source of noise in Fife, any traffic generated as a result of SDP activities is not anticipated to have a significant effect on noise levels attributed to traffic flows along this route. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both dockyards for dismantling would enable faster initial dismantling of the existing laid-up submarines, reducing the timescale of any noise and vibration impacts associated with dismantling activities. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be de-fuelled, which would reduce any noise and vibration impacts associated with submarine transportation.

Option 3/4: RPV removal with storage at remote site

Assessment Criteria	Score 3/4D	Score 3/4R	Score 3/4B	Commentary
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration.	0/-/?	0/-/?	0/-/?	**<u>Potential Effects</u>** SDP activities would generate noise and vibration. Significant sources of on-site noise and vibration include piling works, earth moving equipment, plant and diesel generators and traffic (HGVs, concrete trucks, forklift trucks, delivery vehicles, vans and personnel vehicles). Initial dismantling (RPV removal) is anticipated to require heavy cutting and the use of lifting plant machinery. Activities such as piling works may also cause vibration effects. There is the potential for noise and vibration associated with SDP activities to impact on sensitive receptors (SDP workers, occupants of the dockyard or remote site, residential buildings, community and recreational facilities, and noise sensitive businesses and enterprises), wildlife and historic buildings. The extent to which noise and vibration from SDP activities has an effect on workers, the local community and the surrounding environment depends on the frequency, duration of timing of such activities along with existing ambient noise levels and the proximity to sensitive receptors. Use of industrial plant and tools has the potential to generate localised occupational noise levels which may have health and safety implications for SDP workers. However, statutory construction health and safety requirements will require noise minimisation and appropriate safety equipment to be used, including the use of ear defenders and thus would protect workers from noise and vibration. Modifications to existing facilities and the construction of new dismantling facilities at the Devonport and Rosyth dockyards would increase noise and vibration above current levels at the dockyards, with the potential for impacts on neighbouring sensitive receptors *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, as the Devonport and Rosyth dockyards are operational dockyards and assuming that dismantling activities would take place within the nuclear licensed site in the dockyards away from sensitive receptors, noise disturbance to local communities is expected to be minor. Whilst activities on-site would generate noise and vibration any effects are not anticipated to be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228:2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	0/-/?	0/-/?	0/-/?	In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation/size reduction (full dismantling of the RPV). Depending on the location of the remote site and the activities undertaken at the site, there is the potential for any noise and vibration from interim storage and segregation/size reduction activities to impact on sensitive receptors. At this stage a remote site has not been identified and subsequently any noise and vibration impact of interim storage and segregation/size reduction activities is uncertain. Notwithstanding this, interim storage is expected to be a relatively passive activity involving monitoring and inspection, and therefore is unlikely to generate noise discernible beyond the site. Traffic movements to and from the dockyards (transport of construction materials, general wastes, LLW and the RPVs), particularly HGVs, passing along non-primary routes e.g. lower order, B and C roads) may elevate noise levels adjoining local transport networks *(refer to impacts specific to the Devonport and Rosyth dockyards).* Similarly, traffic movements from the remote site (transport of construction materials, general wastes, delivery of the RPVs to the site and transport of PW off-site) could also elevate noise levels adjoining local transport routes. However, traffic movements associated with SDP activities are unlikely to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)), and therefore any noise disturbance from traffic is anticipated to be minor.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				Depending on submarine transport methods (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used) there is the potential for noise disturbance from any dredging or channel modifications *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, it is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required. Transportation of submarines to and from the dockyards would involve a number of specific activities that could generate noise, in particular the preparation of the hull for transport following RPV removal (with activities such as welding plates onto the hull). Whether any of these activities give rise to nuisance would depend on the timing of the activities and the proximity to sensitive receptors. However, given the frequency of movement (of one submarine per annum), it is unlikely that such effects could be considered significant. Of the technical options, taking account of the scale of development required for the RPV option would be smaller than the other options, with the RPV option requiring a new ILW storage area with a footprint of 801m^2. In consequence any noise and vibration during construction could be less. In addition, construction would also take place on two different sites, reducing noise and vibration impacts from SDP activities as the scale of activity undertaken at the respective sites would be less. In the case of the RPV option the construction of SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for segregation/size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases may help to minimise disturbance and any negative effects on local communities. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	0/-/?	0/-/?	0/-/?	The RPV option involves the cutting of the hull of the submarine and the removal of RC components to enable the removal of the intact RPV. It is anticipated that there would be more noise and vibration during initial dismantling for the RPV option when compared to the equivalent initial phase of the RC option, due to an increase in processing activities at this stage, which would also require use of heavy machinery for longer periods. Subsequent activities associated with storage of the RPV and processing of the ILW arising during dismantling would result in further noise impacts. There is the potential for development of alternative techniques during the delay for RPV removal and size reduction, which could reduce levels of noise and vibration; however, this is very uncertain. In the case of this option as the RPV would need to be transported to the remote site following initial dismantling, there would be additional noise and vibration impacts associated with transportation when compared to the options proposing storage at the point of waste generation. Although in the case of all of the technical options, no significant noise and vibration impacts are anticipated. <u>Devonport Dockyard</u> Major sources of noise in Plymouth include domestic sources, traffic and construction. Plymouth City Airport and Moorcroft Quarry (both on the eastern edge of Plymouth) are also a major source of noise. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				Hamoaze estuary, is the town of Torpoint. Current noise levels at Devonport dockyard are unknown. However, noise surveys undertaken to inform the development of land to the north of Devonport dockyard (undertaken at a location representative of properties on Savage Gardens, Wolseley Road and Hamoaze Avenue) determined that during the daytime the ambient noise (LAeq) was in the range of 47-51 dB(A) and during the nighttime ambient noise was in the range of 41-42dB(A). The noise climate at the time of monitoring was dockyard by general noise from the dockyard and occasional mobile plant activities. Taking account of the scale and nature of the activities to be undertaken, which would be similar to existing activities currently being undertaken at the dockyard, which includes base porting, refitting, defuelling and decommissioning Royal Navy submarines, maintenance of the Royal Navy's surface ship fleet, along with some commercial ship building and maintenance, is there not anticipated to be a significant increase in noise and vibration above current levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities noise and vibration disturbance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)).
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	0/-/?	0/-/?	0/-/?	There are 5 scheduled monuments in the Devonport dockyard (4 in South Yard and 1 in Bull Point). In addition, there are 85 listed buildings, predominantly in South Yard and Bull Point. There is the potential for noise and vibration from dismantling activities to indirectly impact on these assets, although assuming that dismantling activities take place within the nuclear licensed site away from these assets and given the scale of development required and the activities to be undertaken, no significant impacts on these heritage assets are anticipated. As noise and vibration from dismantling activities would be localised and assuming that SDP activities would take place within the nuclear licensed site at Devonport dockyard away from wildlife habitats, limited disturbance to wildlife as a result of noise and vibration is anticipated. There is the potential for any construction works close to the basins to impact upon fish populations in the basins; noise levels close to a percussion pile driver (within about 5m) can exceed the levels that will harm or kill fish. However, no significant upgrades or alterations to the dock structures are anticipated to be required. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation <u>Rosyth Dockyard</u> Major sources of noise in Fife include traffic, particularly the A90 north of the Forth Bridge to the east of Rosyth dockyard. Noise pollution caused by the growth in road transport and congestion is a key issue. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Current noise levels at Rosyth dockyard are unknown. However, noise surveys undertaken to inform the development of land to the east of Rosyth dockyard determined that during the daytime the ambient noise (L_{Aeq}) is in the range of 48-65 dB(A), depending on the proximity to local through roads. Background noise levels (L_{A90}) during the day generally range from 45-51 dB(A). During the night the range of mean background LA90 noise levels between the receptors is relatively narrow at 37.1-39.5 dB(A). Taking account of the scale and nature of the activities to be undertaken, which would be similar to existing activities currently being undertaken at the dockyard, which includes maintenance of the Royal Navy's surface ship fleet and aircraft carrier assembly, is there not anticipated to be a significant increase in noise and vibration above current levels. As dismantling activities would predominantly take place within the nuclear licensed site away from local communities noise and vibration disturbance to surrounding local communities is

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)).
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	0/-/?	0/-/?	0/-/?	There are 2 listed buildings within Rosyth dockyard (the Grade B listed power station and pumping station), both of which are located in the nuclear licensed site within the dockyard. There is the potential for noise and vibration from dismantling activities to indirectly impact on these assets, although given the scale of development required and the activities to be undertaken, no significant impacts are anticipated. As noise and vibration from dismantling activities would be localised and assuming that activities would take place within the nuclear licensed site at Rosyth dockyard away from habitats, limited disturbance to wildlife as a result of noise and vibration is anticipated. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any noise and vibration impacts associated with dredging. **<u>Comparison of the Options</u>** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. Devonport dockyard is located in the city of Plymouth in a built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards and the scale of development required, there is considered to be a greater potential for noise and vibration disturbance from SDP activities at Devonport dockyard when compared to Rosyth dockyard, as fewer sensitive receptors could be affected at Rosyth dockyard, although noise and vibration disturbance as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be minor. Although traffic from Rosyth dockyard may route on to the A90 to the east of the dockyard, which is a major source of noise in Fife, any traffic generated as a result of SDP activities is not anticipated to have a significant effect on noise levels attributed to traffic flows along this route. At this stage a remote site for interim storage and size reduction has not been identified and subsequently the potential effect of noise and vibration impacts on local populations is uncertain. The potential for effects would depend on the location of the remote site, the activities currently undertaken at the remote site and its proximity to local populations. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both dockyards for dismantling would enable faster dismantling of the submarines, reducing the timescale of any noise and vibration impacts associated with dismantling activities. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be de-fuelled, which would reduce any noise and vibration impacts associated with submarine transportation.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration.	-	-	-	**Potential Effects** Modifications to and the construction of new SDP facilities, and submarine dismantling and segregation/size reduction activities at the Devonport and Rosyth dockyards would increase noise and vibration above current levels at the dockyards. Significant sources of on-site noise and vibration include piling works, earth moving equipment, plant and diesel generators and traffic (HGVs, concrete trucks, forklift trucks, delivery vehicles, vans and personnel vehicles). Initial dismantling (RPV removal) is anticipated to require heavy cutting and the use of lifting plant machinery. Activities such as piling works may also cause vibration effects. There is the potential for noise and vibration associated with SDP activities within the dockyards to impact on sensitive receptors (SDP workers, occupants of the dockyard, residential buildings, community and recreational facilities, and noise sensitive businesses and enterprises), wildlife and historic buildings *(refer to impacts specific to the Devonport and Rosyth dockyards).* The extent to which noise and vibration from SDP activities has an effect on workers, the local community and the surrounding environment depends on the frequency, duration of timing of such activities along with existing ambient noise levels and the proximity to sensitive receptors. Use of industrial plant and tools has the potential to generate localised occupational noise levels which may have health and safety implications for SDP workers. However, statutory construction health and safety requirements will require noise minimisation and appropriate safety equipment to be used, including the use of ear defenders and thus would protect workers from noise and vibration. As the Devonport and Rosyth dockyards are operational dockyards and assuming that SDP activities would take place within the nuclear licensed site in the dockyards away from sensitive receptors, noise disturbance to local communities is expected to be minor. Whilst activities on-site would generate noise and vibration any effects are not anticipated to be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228:2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. Traffic movements to and from the dockyards (transport of construction materials, general wastes, LLW, RPVs and PW), particularly HGVs, passing along non-primary routes e.g. lower order, B and C roads) may elevate noise levels adjoining local transport networks *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, traffic movements associated with SDP activities are unlikely to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)), and therefore any noise disturbance from traffic is anticipated to be minor. It is expected that submarines will be towed to/from the dockyard for dismantling such that dredging will not be required. Transportation of submarines to and from the dockyards would involve a number of specific activities that could generate noise, in particular the preparation of the hull for transport following RPV removal (with activities such as welding plates onto the hull). Whether any of these activities give rise to nuisance would depend on the timing of the activities and the proximity to sensitive receptors. However, given the frequency of movement (of one submarine per annum), it is unlikely that such effects could be considered significant. Interim storage is expected to be a relatively passive activity involving monitoring and inspection, and therefore is unlikely to generate noise discernible beyond the sites.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	-	-	-	Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. The potential impact on populations during construction for the PW option could therefore be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on populations from SDP activities as levels of activity and disturbance would be greater. Notwithstanding this, construction would take place on two different sites, reducing any noise and vibration impacts from SDP activities as the scale of activity undertaken at the respective sites would be less. Although in the case of all of the technical options, no significant noise and vibration impacts are anticipated. The PW option involves the cutting of the hull of the submarine and the removal of RC components to enable the removal of the intact RPV. It is anticipated that there would be more noise and vibration during this phase of the PW option when compared to the initial phase of either the RC or RPV options, due to an increase in processing activities at this stage. However, in comparision to the other two technical options the duration of such effects would be shorter overall. <u>Devonport Dockyard</u> Major sources of noise in Plymouth include domestic sources, traffic and construction. Plymouth City Airport and Moorcroft Quarry (both on the eastern edge of Plymouth) are also a major source of noise. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Current noise levels at Devonport dockyard are unknown. However, noise surveys undertaken to inform the development of land to the north of Devonport dockyard (undertaken at a location representative of properties on Savage Gardens, Wolseley Road and Hamoaze Avenue) determined that during the daytime the ambient noise (LAeq) was in the range of 47-51 dB(A) and during the nighttime ambient noise was in the range of 41-42dB(A). The noise climate at the time of monitoring was dockyard by general noise from the dockyard and occasional mobile plant activities. Taking account of the scale and nature of the activities to be undertaken, which would be similar to existing activities currently being undertaken at the dockyard, which includes base porting, refitting, defuelling and decommissioning Royal Navy submarines, maintenance of the Royal Navy's surface ship fleet, along with some commercial ship building and maintenance, is there not anticipated to be a significant increase in noise and vibration above current levels.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	-	-	-	As SDP activities would predominantly take place within the nuclear licensed site away from local communities noise and vibration disturbance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)). There are 5 scheduled monuments in the Devonport dockyard (4 in South Yard and 1 in Bull Point). In addition, there are 85 listed buildings, predominantly in South Yard and Bull Point. There is the potential for noise and vibration from SDP activities to indirectly impact on these assets, although assuming that SDP activities take place within the nuclear licensed site away from these assets and given the scale of development required and the activities to be undertaken, no significant impacts on these heritage assets are anticipated.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				As noise and vibration from SDP activities would be localised and assuming that SDP activities would take place within the nuclear licensed site at Devonport dockyard away from wildlife habitats, limited disturbance to wildlife as a result of noise and vibration is anticipated. There is the potential for any construction works close to the basins to impact upon fish populations in the basins; noise levels close to a percussion pile driver (within about 5m) can exceed the levels that will harm or kill fish. However, no significant upgrades or alterations to the dock structures are anticipated to be required. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation. Rosyth Dockyard Major sources of noise in Fife include traffic, particularly the A90 north of the Forth Bridge to the east of Rosyth dockyard. Noise pollution caused by the growth in road transport and congestion is a key issue. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Current noise levels at Rosyth dockyard are unknown. However, noise surveys undertaken to inform the development of land to the east of Rosyth dockyard determined that during the daytime the ambient noise (L_{Aeq}) is in the range of 48-65 dB(A), depending on the proximity to local through roads. Background noise levels (L_{A90}) during the day generally range from 45-51 dB(A). During the night the range of mean background LA90 noise levels between the receptors is relatively narrow at 37.1-39.5 dB(A).
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	**-**	**-**	**-**	Taking account of the scale and nature of the activities to be undertaken, which would be similar to existing activities currently being undertaken at the dockyard, which includes maintenance of the Royal Navy's surface ship fleet and aircraft carrier assembly, is there not anticipated to be a significant increase in noise and vibration above current levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities noise and vibration disturbance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)). There are 2 listed buildings within Rosyth dockyard (the Grade B listed power station and pumping station), both of which are located in the nuclear licensed site within the dockyard. There is the potential for noise and vibration from SDP activities to indirectly impact on these assets, although given the scale of development required and the activities to be undertaken, no significant impacts on these heritage assets are anticipated. As noise and vibration from SDP activities would be localised and assuming that SDP activities would take place within the nuclear licensed site at Rosyth dockyard away from wildlife habitats, limited disturbance to wildlife as a result of noise and vibration is anticipated. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any noise and vibration impacts associated with dredging. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				and the scale of new development required could be greater at Devonport dockyard. Devonport dockyard is located in the city of Plymouth in a built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards and the scale of development required, there is considered to be a greater potential for noise and vibration disturbance from SDP activities at Devonport dockyard when compared to Rosyth dockyard, as fewer sensitive receptors could be affected at Rosyth dockyard, although noise and vibration disturbance as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be minor. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for noise and vibration from transport of LLW from Plymouth to impact on local communities adjoining local transport networks along the LLW transport route. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any noise and vibration impact from LLW transport is anticipated to be negligible.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	**-**	**-**	**-**	Although traffic from Rosyth dockyard may route on to the A90 to the east of the dockyard, which is a major source of noise in Fife, any traffic generated as a result of SDP activities is not anticipated to have a significant effect on noise levels attributed to traffic flows along this route. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, as submarine dismantling activities would be undertaken on two different sites (initial dismantling of the RPV taking place at one dockyard, and full segregation of the RPV and interim storage of the PW taking place at the other dockyard), this combination option could result in a greater number of transport movements compared to Options 5D and 5R. Option 5B could therefore have a greater potential for impacts on local populations associated with transport when compared to Options 5D and 5R.

Option 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration.	0/-/?	0/-/?	0/-/?	**Potential Effects** SDP activities would generate noise and vibration. Significant sources of on-site noise and vibration include piling works, earth moving equipment, plant and diesel generators and traffic (HGVs, concrete trucks, forklift trucks, delivery vehicles, vans and personnel vehicles). Initial dismantling (RPV removal) is anticipated to require heavy cutting and the use of lifting plant machinery. Activities such as piling works may also cause vibration effects. There is the potential for noise and vibration associated with SDP activities to impact on sensitive receptors (SDP workers, occupants of the dockyard or remote site, residential buildings, community and recreational facilities, and noise sensitive businesses and enterprises), wildlife and historic buildings. The extent to which noise and vibration from SDP activities has an effect on workers, the local community and the surrounding environment depends on the frequency, duration of timing of such activities along with existing ambient noise levels and the proximity to sensitive receptors. Use of industrial plant and tools has the potential to generate localised occupational noise levels which may have health and safety implications for SDP workers. However, statutory construction health and safety requirements will require noise minimisation and appropriate safety equipment to be used, including the use of ear defenders and thus would protect workers from noise and vibration.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	0/-/?	0/-/?	0/-/?	Modifications to existing facilities and the construction of new dismantling and segregation/size reduction facilities at the Devonport and Rosyth dockyards would increase noise and vibration above current levels at the dockyards, with the potential for impacts on neighbouring sensitive receptors *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, as the Devonport and Rosyth dockyards are operational dockyards and assuming that SDP activities would take place within the nuclear licensed site in the dockyards away from sensitive receptors, noise disturbance to local communities is expected to be minor. Whilst activities on-site would generate noise and vibration any effects are not anticipated to be significant due to the need to adhere to the requirements of legislation (Control of Pollution Act, 1974) and best practice set out in BS 5228:2009 (Code of Practice for Noise and Vibration Control on Construction and Open Sites). Good management of any works would ensure that a breach of limits would be unlikely. In the case of this option, following segregation/size reduction of the RPV the PW would be transported off the segregation/size reduction site to a remote site for interim storage. Depending on the location of the remote site and the activities undertaken at the site, there is the potential for any noise and vibration from interim storage to impact on sensitive receptors. At this stage a remote site has not been identified and subsequently any noise and vibration impact of interim storage is uncertain. Notwithstanding this, interim storage is expected to be a relatively passive activity involving monitoring and inspection, and therefore is unlikely to generate noise discernible beyond the site. Traffic movements to and from the dockyards (transport of construction materials, general wastes, LLW, the RPVs and PW), particularly HGVs, passing along non-primary routes e.g. lower order, B and C roads) may elevate noise levels adjoining local transport networks *(refer to impacts specific to the Devonport and Rosyth dockyards).* Similarly, traffic movements from the remote site (transport of construction materials, general wastes, delivery of the PW to the site and transport of PW off-site) could also elevate noise levels adjoining local transport routes. However, traffic movements associated with SDP activities are unlikely to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)), and therefore any noise disturbance from traffic is anticipated to be minor. It is expected that submarines will be towed to/from the dockyard for dismantling such that dredging is unlikely to be required.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				Transportation of submarines to and from the dockyards would involve a number of specific activities that could generate noise, in particular the preparation of the hull for transport following RPV removal (with activities such as welding plates onto the hull). Whether any of these activities give rise to nuisance would depend on the timing of the activities and the proximity to sensitive receptors. However, given the frequency of movement (of one submarine per annum), it is unlikely that such effects could be considered significant. Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. The potential impact on populations during construction for the PW option could therefore be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full segregation and size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on populations from SDP activities as levels of activity and disturbance would be greater. Notwithstanding this, construction would take place on three different sites, reducing any noise and vibration impacts from SDP activities as the scale of activity undertaken at the respective sites would be less. Although in the case of all of the technical options, no significant noise and vibration impacts are anticipated.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	0/-/?	0/-/?	0/-/?	The PW option involves the cutting of the hull of the submarine and the removal of RC components to enable the removal of the intact RPV. It is anticipated that there would be more noise and vibration during this phase of the PW option when compared to the initial phase of either the RC or RPV options, due to an increase in processing activities at this stage. However, in comparision to the other two technical options the duration of such effects would be shorter overall. <u>Devonport Dockyard</u> Major sources of noise in Plymouth include domestic sources, traffic and construction. Plymouth City Airport and Moorcroft Quarry (both on the eastern edge of Plymouth) are also a major source of noise. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Current noise levels at Devonport dockyard are unknown. However, noise surveys undertaken to inform the development of land to the north of Devonport dockyard (undertaken at a location representative of properties on Savage Gardens, Wolseley Road and Hamoaze Avenue) determined that during the daytime the ambient noise (LAeq) was in the range of 47-51 dB(A) and during the nighttime ambient noise was in the range of 41-42dB(A). The noise climate at the time of monitoring was dockyard by general noise from the dockyard and occasional mobile plant activities. Taking account of the scale and nature of the activities to be undertaken, which would be similar to existing activities currently being undertaken at the dockyard, which includes base porting, refitting, defuelling and decommissioning Royal Navy submarines, maintenance of the Royal Navy's surface ship fleet, along with some commercial ship building and maintenance, is there not anticipated to be a significant increase in noise and vibration above current levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities noise and vibration disturbance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)). There are 5 scheduled monuments in the Devonport dockyard (4 in South Yard and 1 in Bull

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				Point). In addition, there are 85 listed buildings, predominantly in South Yard and Bull Point. There is the potential for noise and vibration from dismantling activities to indirectly impact on these assets, although assuming that SDP activities take place within the nuclear licensed site away from these assets and given the scale of development required and the activities to be undertaken, no significant impacts on these heritage assets are anticipated.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	0/-/?	0/-/?	0/-/?	As noise and vibration from SDP activities would be localised and assuming that SDP activities would take place within the nuclear licensed site at Devonport dockyard away from wildlife habitats, limited disturbance to wildlife as a result of noise and vibration is anticipated. There is the potential for any construction works close to the basins to impact upon fish populations in the basins; noise levels close to a percussion pile driver (within about 5m) can exceed the levels that will harm or kill fish. However, no significant upgrades or alterations to the dock structures are anticipated to be required. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation. <u>Rosyth Dockyard</u> Major sources of noise in Fife include traffic, particularly the A90 north of the Forth Bridge to the east of Rosyth dockyard. Noise pollution caused by the growth in road transport and congestion is a key issue. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Current noise levels at Rosyth dockyard are unknown. However, noise surveys undertaken to inform the development of land to the east of Rosyth dockyard determined that during the daytime the ambient noise (L_{Aeq}) is in the range of 48-65 dB(A), depending on the proximity to local through roads. Background noise levels (L_{A90}) during the day generally range from 45-51 dB(A). During the night the range of mean background LA90 noise levels between the receptors is relatively narrow at 37.1-39.5 dB(A). Taking account of the scale and nature of the activities to be undertaken, which would be similar to existing activities currently being undertaken at the dockyard, which includes maintenance of the Royal Navy's surface ship fleet and aircraft carrier assembly, is there not anticipated to be a significant increase in noise and vibration above current levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities noise and vibration disturbance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)). There are 2 listed buildings within Rosyth dockyard (the Grade B listed power station and pumping station), both of which are located in the nuclear licensed site within the dockyard. There is the potential for noise and vibration from SDP activities to indirectly impact on these assets, although given the scale of development required and the activities to be undertaken, no significant impacts are anticipated.
D. Noise and Vibration Minimise disturbance and stress to people, wildlife and historic buildings caused by noise and vibration. *(continued)*	0/-/?	0/-/?	0/-/?	As noise and vibration from SDP activities would be localised and assuming that activities would take place within the nuclear licensed site at Rosyth dockyard away from habitats, limited disturbance to wildlife as a result of noise and vibration is anticipated. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any noise and vibration impacts associated with dredging.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				Comparison of the Options Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Devonport dockyard is located in the city of Plymouth in a built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards and the scale of development required, there is considered to be a greater potential for noise and vibration disturbance from SDP activities at Devonport dockyard when compared to Rosyth dockyard, as fewer sensitive receptors could be affected at Rosyth dockyard, although noise and vibration disturbance as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be minor. Although traffic from Rosyth dockyard may route on to the A90 to the east of the dockyard, which is a major source of noise in Fife, any traffic generated as a result of SDP activities is not anticipated to have a significant effect on noise levels attributed to traffic flows along this route. At this stage a remote site for interim storage has not been identified and subsequently the potential effect of noise and vibration impacts on local populations is uncertain. The potential for effects would depend on the location of the remote site, the activities currently undertaken at the remote site and its proximity to local populations. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined.

A5. Soil and Geology

5.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on soil and geology. Information is presented for both national and sub-regional levels.

Soil and geology within this context is concerned with important geological sites, and the contamination of soils.

There are links between the soil and geology topic and other topics in the SEA, including waste management, and resources and raw materials.

5.2 Summary of Plans and Programmes

5.2.1 International

The ***European Thematic Strategy on Soil Protection (2006)*** sets out the European Commission's strategy on soils and includes a proposal for an EU wide ***Soils Directive***. The overall objective of the strategy is the protection and sustainable use of soil, based on the following guiding principles:

- preventing further soil degradation and preserving its functions;
- when soil is used and its functions are exploited, action has to be taken on soil use and management patterns;
- when soil acts as a sink/receptor of the effects of human activities or environmental phenomena, action has to be taken at source; and
- restoring degraded soils to a level of functionality consistent at least with current and intended use, thus also considering the cost implications of the restoration of soil.

UK

The ***Environmental Protection Act (1990)*** defines within England, Scotland and Wales the legal framework for duty of care for waste, contaminated land and statutory nuisance.

The ***Environment Act 1995*** seeks to protect and preserve the environment and guard against pollution to air, land or water. The Act adopts an integrated approach to environmental protection and outlines where authorisation is required from relevant authorities to carry out certain procedures as well as outlining the responsibilities of the relevant authorities. The Act also amends the Environment Protection Act 1990 with regard compulsory remediation of contaminated land. Environmental Protection Act was also modified in 2006 to cover radioactivity, and then a further modification made in 2007 to cover land contaminated with radioactivity originating from nuclear installations.

The ***Wildlife and Countryside Act 1981*** allows the designation of SSSIs for sites with geological importance.

England

Safeguarding our Soils: A Strategy for England (2009) sets out the soil strategy for England and includes objectives and actions for Defra to better protect agricultural soils, protect and enhance stores of soil carbon, build the resilience of soils to a changing climate, prevent soil pollution, protect soil during construction and development and to deal with contaminated land.

The ***Contaminated Land (England) Regulations 2006*** sets out provisions relating to the identification and remediation of contaminated land. It identifies sites requiring regulation as 'special sites' and adds land contaminated by radioactive substances to this classification.

Planning Policy Statement 9 Biodiversity and Geological Conservation requires that planning policies and decisions should aim to maintain, and enhance, restore or add to biodiversity and geological conservation interests. ***Planning Policy Statement 23: Planning and Pollution Control*** requires that significant developments use land of poorer soil quality, except where this would be inconsistent with other environmental objectives and wider sustainability considerations.

Government policy in relation to the protection of agricultural land is set out in ***Planning Policy Statement 7: Sustainable Development in Rural Areas (PPS7)***. Where significant development of agricultural land is unavoidable, poorer quality land should be used in preference to that of higher quality. The Agricultural Land Classification (ALC) provides a method for assessing the quality of farmland to enable informed choices to be made by local planning authorities. The best and most versatile land is defined as Grades 1, 2 and 3, which is the most flexible, productive and efficient land which can best deliver future crops.

Within the ***MOD Sustainable Development JSP 418 - Volume 2 and Environment Manual*** is the objective to To assess the land quality across the entire estate in order to provide a proper knowledge of the condition of the estate and ensure that it is 'suitable for use' and not causing harm to human health or the environment. Where it is identified that an unacceptable risk is posed by the presence of contamination early action must be taken to reduce and control those risks to an acceptable level.

Scotland

The main aim of the ***Scottish Soil Framework (2009)*** is to promote the sustainable management and protection of soils consistent with the economic, social and environmental needs of Scotland. The Framework identifies a wide range of activities that will contribute to 13 soil outcomes, including factors such as maintaining soil structure, reduce soil erosion and where possible remediate, maintain and enhance soil's productive capacity, reduce soil contamination, protect organic and enhance where appropriate..

The ***Scottish Planning Policy (SPP***) ***(2010)*** sets out the Scottish Government's policy on land use planning and includes objectives regarding safeguarding minerals.

Planning Advice Note 33: Development of Contaminated Land (PAN33) provide advice on implication on the development of contaminated land and the approach to contaminated land in development plans.

A scheme for remedying contaminated land is introduced in the ***Contaminated Land (Scotland) Regulations (2005).*** This scheme identifies special sites' enforced by SEPA, remediation notices and their contents, and sets out the information to be held on a contaminated land register maintained by local councils.

Radioactive Contaminated Land (Scotland) Amendment Regulations (2009) provide regulations for access to and identification of land that may be contaminated by radioactivity. Where such land is causing lasting exposure of radiation to any person or where there is a significant possibility of such exposure, the regime will also allow for remediation, under circumstances where intervention is liable to be justified.

Wales

Technical Advice Note 6: Agricultural and Rural Development (TAN6) stipulates that, in considering planning applications, local planning authorities should consider the quality of agricultural land and other agricultural factors and seek to minimise any adverse affects on the environment.

Minerals Technical Advice Note 1: Aggregates (MTS1) main objective is to provide aggregate resources in a sustainable way to meet society's needs for construction materials.

The ***Radioactive Contaminated Land (Wales) Regulations (2007)*** were modified in 2006 to cover land contaminated with radioactivity originating from nuclear installations.

Northern Ireland

The ***Waste and Contaminated Land (Northern Ireland) Order (1997)*** sets out the waste management regime covering waste carrier registration and identifying and remedying contaminated land.

The ***Radioactive Contaminated Land Regulations (Northern Ireland) (2006)*** outline basic safety standards for protecting the health of workers and the public from the dangers of ionising radiation.

5.2.2 Sub-regional locations

Plymouth

Devon County Minerals Local Plan (2004) contains a number of objectives regarding balancing the demand for mineral resources with the need to protect the environment and sustainable development principles.

Fife

Fife Minerals Local Plan (2004) seeks to achieve a balance between meeting the requirement for minerals and environmental protection thereby ensuring that any development takes place in the most sustainable locations and in a more sustainable way. ***Fife Contaminated Land Inspection Strategy (2010)*** seeks, amongst other objectives, to prevent further land contamination.

5.3 Overview of the Baseline

5.3.1 National

UK

The geology of the UK is diverse and has resulted in over 800 soil types. As a broad overview the following rock types exist in a progression from North West to South East (predominant rock types): Tertiary Volcanic Rocks; Crystalline Rock of Pre-Cambrian and later age; Lower Carboniferous to Cambrian; Triassic and Permian; Early Precambrian and Devonian; Jurassic; Cretaceous; Tertiary and Marine Pleistocene; and finally a return to Cretaceous.[210]

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[210] Agricultural Land Classification, protecting the best and most versatile agricultural land, Natural England, January 2009

The quality of the land across the UK varies, with the best and most versatile agricultural land generally situated in the lowland and valley areas of England. Due to the topography and terrain, much of Scotland and Wales is classified as lower grade land. An estimated 21% of all farmland in England is Grade 1 and 2 land, with a similar percentage graded as subgrade 3a land. These grades are the best and most versatile land grades as classified under the Agricultural Land Classification System.[211]

The UK has a diversity of mountain ranges and flood plains. In England, the southern part of the country is predominantly lowland, with mountainous terrain north west of the Tees-Exe line (the Lowland-Upland divide across England), which includes the Cumbrian Mountains of the Lake District, the Pennines and limestone hills of the Peak District, Exmoor and Dartmoor.[212]

There are an estimated 2,050 geological SSSIs in UK.[213, 214, 215]

Across the UK there are also a number of non-statutory geological and geomorphological sites designated at a local level, i.e. often known as Local Geological Sites (formerly Regionally Important Geological and Geomorphological Sites (RIGS)). There are over 50 Local Sites groups in the UK.[216]

In 2005 there was estimated to be around 413,906 hectares of land affected by industrial activity in England and Wales which may be contaminated, (around 2% of the land area in England and Wales).[217]

In March 2008 75% of the UK built estate (around 59,600 ha) was covered by a land assessment.[218]An estate wide Land Quality Assessment (LQA) programme has been established and is being managed by Defence Estates. The results of LQA carried out to date indicate there is no wide spread contamination on the defence estate.[218]

England

In England there was estimated to be around 307,672 hectares of land that may be contaminated. A total of 659 sites had been determined as ‘contaminated land’ in England by the end of March 2007. At the time of reporting, no site has been determined as contaminated land due to radioactivity.[219]

Natural England (2008) report that there are 1,214 SSSIs designated for their geodiversity features

211 England’s geology, Natural England, http://www.naturalengland.org.uk/ourwork/conservation/geodiversity/englands/default.aspx
212 State of the Environment Report 2008, Natural England, 2008, http://naturalengland.etraderstores.com/NaturalEnglandShop/NE85
213 Geoconservation Sites, http://www.geoconservation.com/sites/sssi.htm
214 Natural England RIGS, http://www.naturalengland.org.uk/ourwork/conservation/designatedareas/lgs/default.aspx
215 The Scottish Soil Framework, Scottish Government, May 2009, http://www.scotland.gov.uk/Publications/2009/05/20145602/13
216 Geoconservation Sites, http://www.geoconservation.com/sites/sssi.htm
217 Indicators for Land Contamination, Science Report SC030039/SR, Environment Agency, August 2005
218 Ministry of Defence Sustainable Development: Progress against key targets and actions March 2009, http://www.mod.uk/NR/rdonlyres/47421155-FBC6-48E5-9E34-62CD1893/4D20B/0/ProgressReport2009.pdf
219 Dealing with contaminated land in England and Wales A review of progress from 2000-2007 with Part 2A of the Environmental Protection Act, Environment Agency, January 2009

covering 1,704 Geological Conservation Review (GCR) sites (which identified nationally important features of geological interest). Many SSSIs have more than one GCR feature and some GCR features extend over more than one SSSI, giving a total of 1,735 SSSI-GCR combinations, or 'geo-features'. The proportion of GCRs in favourable/recovering status varied between 76-94% depending on its category of GCR (each category is reported separately).

Within England, 87.7% of the land area is classed as agricultural land. [220] Of the remainder, 5% is non agricultural and 7.3% is urban. Of the 87.7% of land classed as agricultural, 65.1% is classed as moderate or better.

There are no formal international designations for geodiversity sites equivalent to the SPA and SAC designations for biological features, although the geodiversity of the Dorset and East Devon Coast is recognised through World Heritage Status.

England contains two Geoparks: the English Riviera in Devon and the North Pennines AONB. These are areas considered by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) to be of international importance for geological heritage that should be safeguarded and sustainably managed and include strong local involvement. Two further sites in England (Abberley and Malvern Hills and the Cotswold Hills) identify themselves as Geoparks.

Scotland

In 2005, there was estimated to be around 82,034 hectares of land affected by industrial activity in Scotland that may be contaminated. A total of 13 sites (equivalent to 53 hectares) had been determined as 'contaminated land' in Scotland by the end of 2008. [221]

As a broad overview the following rock types exist in a progression from North East to South West (predominant rock types): Pre-Cambrian (the Highlands); Carboniferous (Midland Valley area); and Ordovician and Silurian (Southern Uplands). Scotland has a large variety of soils reflecting its geological and climatic diversity. Scotland's soil is predominantly carbon rich, with podzols, peat soils and gleys accounting for more than two-thirds. These soils are found throughout Scotland with the exception of the Central Valley, which is dominated by mineral soils. Soils in the north and west are more acidic on the whole and rich in organic matter. Scotland contains a much higher proportion of organic soils than the rest of the UK. [222]

The quality of land is highly variable with much of Scotland classified as Less Favoured Areas (suited

[220] Agricultural land classification (ALC) Statistics from the digital 1:250,000 scale Provisional ALC map (www.magic.gov.uk)
[221] State of the Environment Soil Quality Report, Scottish Environment Protection Agency, 2001
[222] Land Use Strategy Strategic Environmental Assessment Screening and Scoping Report, Scottish Government, March 2010, http://www.scotland.gov.uk/Topics/Environment/Countryside/Landusestrategy/sea

only for improved grassland and rough grazing). Class 1 agricultural soils (suitable for a very wide range of crops) make up just 0.1% of the total land area according to the Land Capability for Agriculture classification scheme, which is distributed predominantly along the eastern coasts, and the Firths of Forth and Tay.

Topographically, Scotland is divided into three main areas; the Highland region in the north, which includes the Cairngorm and Grampian mountain ranges; the Central Lowlands, which includes the major cities of Edinburgh and Glasgow; and the Southern Uplands, a pastoral upland area north of the English Border.

There are estimated to be 309 SSSIs with geological designation in Scotland.[223]

Scotland has three Geoparks: North West Highlands Geopark, Lochaber Geopark and Shetland Geopark.[224]

Wales

In 2005, there was estimated to be around 24,200 hectares of land affected by industrial activity in Wales that may be contaminated.[225] A total of 122 sites had been determined as 'contaminated land' in Wales by the end of March 2007. [2] No site has been determined as contaminated land due to radioactivity. [226]

Sedimentary rocks underlie the majority of Wales, which are then overlain by a suite of acid soils, characterised by a peaty surface horizon. As a broad overview the following rock types exist in a progression from North West to South East (predominant rock types): Ordovician; Silurian; Devonian; and Carboniferous Peat covers 3% to 4% of Wales and is predominantly acid blanket peat, but with small areas of raised bog and fen peat scattered in lowland areas.[227]

The majority of land in Wales (almost 80%) is classified as a Less Favoured Area (areas which are difficult to farm due to limitations such as climate, location or features of the landscape, e.g. mountainous or hilly areas), almost all of which falls within the Severely Disadvantaged Area subcategory. [228]

Wales is predominantly mountainous, with the Cambrian Mountains occupying almost the entire area. There are narrow coastal plains in the south and west and small lowland areas in the north.

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[223] The Scottish Soil Framework, Scottish Government, May 2009, http://www.scotland.gov.uk/Publications/2009/05/20145602/13
[224] Dealing with land contamination in Scotland: A review of progress 2000-2008, Scottish Environment Protection Agency, 2008, http://www.sepa.org.uk/land/land_publications.aspx
[225] Indicators for Land Contamination, Science Report SC030039/SR, Environment Agency, August 2005
[226] Dealing with contaminated land in England and Wales A review of progress from 2000-2007 with Part 2A of the Environmental Protection Act, Environment Agency, January 2009
[227] Farming and Countryside, Welsh Assembly Government, http://wales.gov.uk/topics/environmentcountryside/farmingandcountryside/maps/lfamap/?lang=en
[228] Environment Strategy for Wales, Welsh Assembly Government, 2006, http://wales.gov.uk/topics/environmentcountryside/epq/envstratforwales/strategy/?lang=en

There are estimated to be approximately 450 SSSIs with geological designation in Wales. There are also 351 Geological Conservation Review Sites and 1 Geopark (Forest Fawr) in Wales. The Isle of Anglesey is currently preparing an application to become a member of the Geopark Network, although it is not yet a Geopark.

Northern Ireland

In 2009, an estimated 12,000 sites were identified that had been used for a purpose which could potentially have caused contamination.[229]

The geology of Northern Ireland varies considerably, although the predominant rock types are Igneous Basalt and Silurian sandstone and shale. The main types of soil in Northern Ireland are rankers, brown earths, podzols and gleys.[230]

Agri-food and Biosciences Institute Agricultural land classification of the region concludes the highest class of land (class 1) does not occur in Northern Ireland. Classes 2-3a account for 31% of the land and are the best and most versatile agricultural soils.[230]

Northern Ireland consists mainly of low-lying plateaus and hills. The highest region is the Mourne Mountains in the south east. Lough Neagh, the largest lake in the UK is around 30km west of Belfast.

There are around 76 Areas of Special Scientific Interest (ASSIs) with geological designation in Northern Ireland.[231] Most raised bogs in Northern Ireland are designated ASSI's (equivalent to a geological SSSI in England, Scotland and Wales).[232]

Across Northern Ireland there are also a number of non-statutory geological and geomorphological sites designated at a local level. The number of Local Sites is unknown. There is one Geopark in Northern Ireland, the Marble Arch Caves Geopark, which straddles the border of Northern Ireland and the Republic of Ireland.

5.3.2 Sub-regional locations

Plymouth

The predominant geology in Plymouth is Upper Devonian slates and shales.[233] The southern parts of

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[229] Planning and Land Contamination, Northern Ireland Environment Agency, http://www.ni-environment.gov.uk/land-home/land-quality.htm
[230] 'Our Environment, Our Heritage, Our Future' State of the Environment Report for Northern Ireland, Department of the Environment, March 2008, http://www.ni-environment.gov.uk/index/about-niea/state_of_the_environment/state_of_the_environment_report.htm
[231] MOD, Sustainable Development Report and Action Plan, 2008, http://www.mod.uk/NR/rdonlyres/D8407A1C-CA68-4AD4-8E17-9F71B151AF6A/0/SusDevReport2008.pdf
[232] Planning and Land Contamination, Northern Ireland Environment Agency, http://www.ni-environment.gov.uk/land-home/land-quality.htm
[233] Plymouth City Council, Characteristics of the City of Plymouth

Plymouth lie on Devonian Limestone whilst the northern parts lie on Devonian Shillets. These very different geologies give rise to diverse soils with the shillets producing acid soils and the limestone more calcareous soils.[233]

There is a belt of hard grey limestone which runs across its southern edge of Plymouth producing the cliffs overlooking the Sound. [233]

Interesting topological features in the area include a high ridge along the southern waterfront with the land beyond rising gently to the north. The rise is interspersed with several ridges and dips cut by rivers, notably the Tamar and Plym.[234]

Plymouth has six SSSIs designated for their geological importance: Faraday Road, Mount Wise, Plymouth Sound, Shores & Cliffs; Richmond Walk; Wallsend Industrial Estate; and Western King.[235]

Plymouth has one 'special site' designated under the Contaminated Land Regulations, at Keyham oil fuel depot.[236]

Fife

Fife is dominated by rocks of the Devonian and Carboniferous periods, with approximately 75% of the area underlain with sedimentary rocks and 20% of the area underlain with igneous rocks of these periods. [237]

Geologically, the area is defined by two parallel fault lines, approximately 50 miles apart, between which land has subsided, creating an ancient rift valley (the Midland Valley). The Midland Valley is, however, quite diverse in character ranging from low lying arable farmland to large areas of upland pasture and moorland. [237]

The area of Clackmannanshire and Fife have 24 SSSIs designated for their geology.[238]

Notable features occur where the underlying igneous rock protrudes through the sedimentary layers. Around much of the eastern and southern coast of Fife there is an almost continuous terrace of flat land raised above current sea level. Alluvial deposits and soils occur along the valley floors and lock basins, with occasional areas of peat. [237]

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http://www.plymouth.gov.uk/homepage/environmentandplanning/environmentalissues/contlandinspectionstrategy/characteristicsplymouth.htm

[234] Plymouth City Council, Devonport conservation area, http://www.plymouth.gov.uk/homepage/creativityandculture/heritageandhistory/historicenvironment/conservationareas/devonportca.htm

[235] Plymouth City Council. http://www.plymouth.gov.uk/homepage/environmentandplanning/natureconservation/geology/ergs/geologysssi.htm

[236] Plymouth City Council, http://www.plymouth.gov.uk/contaminated_land_register.pdf

[237] SNH, Fife Landscape Character Assessment, David Tyldesley and Associates (1999), http://www.snh.org.uk/pdfs/publications/review/113.pdf

[238] JNCC, Geological Conservation Review, http://www.jncc.gov.uk/default.aspx?page=4177&authority=UKM22

5.4 Existing problems

5.4.1 National

UK

Human activity has left a legacy of soil contamination and pollution that pose a risk to water quality, ecosystems and human health as well as to land and property value.

Significant areas across the UK carry a burden of contamination from industrial activity, although this is progressively being cleaned up as sites are redeveloped. Whilst contamination is remediated during redevelopment, the process can be expensive.

Disturbance of contaminated sites carries the risk of pollution pathways being created or re-opened for any existing ground contamination.

There is currently increasing pressure on rural and agricultural land from developers as urban areas expand. Future population growth leading to an increase in the need for housing and related urban development infrastructure will put more pressure on protected land including important geological sites.

Soil degradation in England and Wales is accelerating. This is in part a natural phenomenon but some soil degradation processes are exacerbated by unsustainable human uses. Major threats include: erosion, organic matter decline, compaction, salinisation, landslides, contamination, sealing and biodiversity decline.[239]

According to the England Soil Strategy soils continue to face three main threats:

- soil erosion by wind and rain: Erosion affects both the productivity of soils but also water quality and aquatic ecosystems;
- compaction of soil reduces agricultural productivity and water infiltration, and increases flood risk through higher levels of run off; and
- organic matter decline: The loss of soil organic matter reduces soil quality, affecting the supply of nutrients and making it more difficult for plants to grow, and increases emissions to the atmosphere.

[239] Dealing with contaminated land in England and Wales A review of progress from 2000-2007 with Part 2A of the Environmental Protection Act, Environment Agency, January 2009

Climate change and loss of organic matter are the most significant threats to Scottish soils.[240] The effect of industry, agricultural practices, forestry and climate change upon soils, particularly carbon rich peat soils, is also a key issue. Key pollutants include chemicals, oil or waste. Organic waste, including sewage sludge, is one of the main sources of heavy metal contamination of soils from human activities.[240]

In Wales the small proportion of land that is classified as 'best and most versatile' agricultural land needs to be conserved. There is also a need to protect soils in uplands and wetlands which contain high amounts of carbon and are vulnerable to acidification. [241]

The main pressures in Northern Ireland are development, infrastructure, mineral extraction industries, and tourism. A major problem in farmland is the over-accumulation of phosphorus in the soil, due to agricultural fertilisers. The intensification and expansion of agriculture is a key pressure on soil quality and erosion. [242]

5.4.2 Sub-regional locations

Plymouth

Plymouth and its surroundings have experienced intense industrial activity in many areas from the 18th and 19th centuries, right through to the present day. It has left a legacy of potentially contaminated land at sites used for former industry, waste disposal and also where previous excavations and low-lying areas have been in-filled.

Fife

Fife has approximately 7,000 sites potentially affected with contamination, mainly as a result of its industrial heritage. [243]

[240] State of the environment and trends – Scotland, http://www.seaguidance.org.uk/11/State-of-the-Environment.aspx
[241] Environment Strategy for Wales, Welsh Assembly Government, 2006, http://wales.gov.uk/topics/environmentcountryside/epq/envstratforwales/strategy/?lang=en
[242] Planning and Land Contamination, Northern Ireland Environment Agency, http://www.ni-environment.gov.uk/land-home/land-quality.htm
[243] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1

5.5 Likely evolution of the baseline

5.5.1 National

UK

There is little data on the long term trends associated with soil; however, Defra have stated in the Soil Strategy (Defra 2009) that they have begun work to take a long-term view of all types of land use including the Land Use Futures Project to analyse future land use challenges through looking at pressures and trends and developing scenarios and models, including the consideration of soil issues.

There is a steady loss of soils to development, contaminated sites, damage by muddy floods and water pollution by silt and fertilisers.[245] Continued pressure of development will result in the loss of productive soil, although it is also likely to lead to the remediation of contaminated soils. As more brownfield land is developed there may be more pressure for development on greenfield land which is likely to increase loss of soil resources. Climate change means that the UK is likely to see an increase in rainfall intensity which could lead to increased soil loss due to erosion.

However, the increase in public and policy awareness regarding geological SSSI sites and Geoparks may lead to an increase in the number of sites protected and managed. As quarries come to the end of their working lives there is potential for their identification and conservation as geologically important sites.

As there are now more stringent statutory controls on land contamination and remediation, increased areas of historic contamination are being remediated and fewer areas are being left in a contaminated state following decommissioning of commercial and industrial sites. Major remediation, regeneration and development projects, such as the Olympic Park and Thames Gateway developments in London are likely to further decrease the total area of contaminated land within the UK.

There are a number of European directives that are either currently being implemented or are under discussion that may influence the way in which land contamination is managed in the future (i.e. the Environmental Liabilities, Soil, Water, Groundwater and the Waste Framework Directives. The implementation of these regimes into UK legislation is likely to affect how contaminated land is dealt with[244]

By 2010, the MOD will establish an estate-wide Land Quality Assessment (LQA) programme to make sure resources are prioritised effectively and to allow improved reporting in this area.

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[244] Dealing with contaminated land in England and Wales A review of progress from 2000-2007 with Part 2A of the Environmental Protection Act, Environment Agency, January 2009

England

An estimated 25,000 inspections of land took place in England between 2000 and 2007.[245]

Key objectives and targets within the Soil Strategy for England include:[246]

- To develop plans for future soil monitoring by 2010;
- To undertake further research in areas including best practices to protect and enhance levels of soil organic matter, contribution of soil management to flood mitigation and best practices to prevent and remediate soil degradation;
- To significantly reduce the rate of loss of stored soil carbon by 2020;
- To halt the decline of soil organic matter caused by agricultural practices in vulnerable soils by 2025; and
- To introduce a reviewed Soil Protection Review to make it a more effective tool for soil management.

Scotland

In Scotland, an estimated 27,000 inspections of land with the potential to be contaminated have already been or are in the process of being undertaken (equating to an estimated 40% of all such sites). A total of 807 sites (equivalent to 1,864 hectares) of land that was affected by contamination have been remediated.[247]

There is some evidence that soils are becoming slightly less acidic in some areas of Scotland due to reduced acid deposition. Ecological damage to soils caused by run-off from roads and urban areas is likely to increase. Agricultural land is being developed at twice the rate as in the 1990s. This development is likely to have occurred on some of Scotland's versatile and productive soils. There is some evidence that levels of organic matter may be declining.[248]

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[245] Dealing with contaminated land in England and Wales A review of progress from 2000-2007 with Part 2A of the Environmental Protection Act, Environment Agency, January 2009
[246] Safeguarding our Soils: A Strategy for England, Defra, 2009, http://www.defra.gov.uk/environment/quality/land/soil/documents/soil-strategy.pdf
[247] Dealing with land contamination in Scotland: A review of progress 2000-2008, Scottish Environment Protection Agency, 2008, http://www.sepa.org.uk/land/land_publications.aspx
[248] State of the environment and trends – Scotland, http://www.seaguidance.org.uk/11/State-of-the-Environment.aspx

The Scottish Soil Framework (2009) aims to acheive 13 soil outcomes:[249]

- soil organic matter stock protected and enhanced where appropriate;
- soil erosion reduced and where possible remediated;
- soil structure maintained;
- greenhouse gas emission from soils reduced to optimum balance;
- soil biodiversity, as well as above ground biodiversity, protected;
- soils making a positive contribution to sustainable flood management;
- water quality enhanced through improved soil management;
- soil's productive capacity to produce food, timber and other biomass maintained and enhanced;
- soil contamination reduced;
- reduced pressure on soils by using brownfield sites in preference to greenfield;
- soils with significant historical and cultural features protected;
- knowledge and understanding of soils enhanced, evidence base for policy review and development strengthened; and
- effective co-ordination of all stakeholders' roles, responsibilities and actions.

Wales

In Wales, an estimated 6,500 inspections of land with the potential to be contaminated have been completed between 2000 and 2007. [250]

Included within the Environment Strategy for Wales is the objective to manage soil was its Soil is ability to support plants and animals, store carbon and provide other important ecosystem services is safeguarded by 2026. Changes in soil carbon will be used as an indicator to measure progress of the

[249] Scottish Soil Framework (2009) http://www.scotland.gov.uk/Publications/2009/05/20145602/0
[250] Dealing with contaminated land in England and Wales A review of progress from 2000-2007 with Part 2A of the Environmental Protection Act, Environment Agency, January 2009

objective and further indicators are to be selected when the UK Soil Indicator Consortium reports.[251]

Northern Ireland

Northern Ireland is in the early stages of implementing statutory monitoring and reporting of land contamination and remediation and therefore no trend data is readily available.

No further targets other than those on a international and UK level were identified for Northern Ireland.

5.5.2 Sub-regional locations

Plymouth

No information was identified on the past trends of soil resources or land contamination within Plymouth. However, Devon County Council set out a number of relevant targets in their Local Mineral Plan, including: [252]

- to strike a balance between the demand for all mineral resources and the need to protect the environment and sustainable development principles;
- to protect the quality and diversity of the County's earth science and nature conservation interest, historic environment, water environment and landscape character; and
- progressive restoration of mineral sites.

Fife

Soil erosion, loss of organic matter and progressive loss of greenfield sites are established trends that are likely to continue. However, aims to reduce levels of brownfield, derelict and contaminated land in the plan area and consequently prioritise of developments onto brownfield sites could slow the trend.[253]

5.6 Assessment objective, guide questions and significance

The objective and guide questions related to soil and geology that have been used in the assessment of

[251] Environment Strategy for Wales (2008) http://cymru.gov.uk/topics/environmentcountryside/epq/envstratforwales/strategy/;jsessionid=PQ2DN1rZNVdZ3pGhRYq4jRYlycX5D8Hd2npyX0bJvZh1LGhJ4ljq!-342331487?lang=en&ts=3

[252] Devon CC, Devon County Minerals Local Plan

[253] Fife Council, Fife Structure Plan 2006 - 2026 Post Adoption SEA 2010, http://www.fifedirect.org.uk/uploadfiles/publications/c64_PostAdoption-FinalisedPostAdoptionSEAStatement-January20101.pdf

the effects of the SDP are set out in Table 5.1, together with reasons for their selection.

Table 5.1 Approach to assessing the effects of SDP on geology and soils

Objective/guide question	Reasoning
Objective: To conserve and enhance soil and geology	The SEA Directive requires that likely significant effects on soil be taken into account in the Environmental Report.
Will the SDP Proposals have an effect on soil quality, variety, extent and/or compaction levels?	Loss of soil quality, variety, extent or an increase in soil compaction will lead to degradation of soil. The European Thematic Strategy on Soil Protection seeks the protection and sustainable use of soil preventing soil degradation and ensuring restoration of degraded soils.
Will the SDP proposals have an effect on soil function and processes?	The European Thematic Strategy on Soil Protection seeks the protection and sustainable use of soil, including preserving its functions or restoring degraded soils to a level of functionality consistent at least with current and intended use.
Will the SDP Proposals increase the risk of significant soil contamination?	Environment Act 1995 seeks to protect and preserve environment against pollution to land. Radioactive Contaminated Land Regulations include regulations for land that may be contaminated by radioactivity. Soil Strategy for England and Scottish Soil Framework include objectives on reducing/preventing soil pollution and contamination.
Will the SDP Proposals have an effect on any known and existing contamination?	Significant areas of the UK carry a burden of contamination from industrial activity. Disturbance of contaminated sites carry the risk of pollution pathways being created or re-opened for existing ground contamination.
Will the SDP Proposals affect geological conservation sites and important geological features?	PPS9 sets out that planning policies and decisions should aim to maintain and enhance, restore or add to sites of geological conservation interest.
Will the SDP Proposals affect land stability?	Invasive construction techniques have the potential to negatively affect land stability.

Table 5.2 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the soil and geology objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 5.2 Approach to determining the significance of effects on geology and soils

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option would restore and significantly improve soil quality and land stability to conditions beyond current levels and remove all soil contamination so that soil functions and processes would be significantly improved in the long term. • Option will lead to an increase in the versatility of the site so that there are more potential opportunities for use of site compared to prior to development (e.g. – site may be used for any use including agricultural purposes). • Option would have a significant and sustained positive impact on a national designated geological site.
+	Positive	• Option would cause minor improvements in soil quality and land stability at site compared to prior to the development and will remove some soil contamination so that soil functions and processes would be improved in the long term. • Option will reduce any potential hazard associated with existing soil contamination. • Option will lead to an increase in the versatility of the site so that there are some more potential opportunities for use of site compared to prior to development (e.g. – a site that previously could only be used for specific industrial use will be able to be used for any employment use). • Option would have a minor and temporary positive impact on a national designated geological site.
0	No (neutral effects)	• Option would result in soil quality being restored to prior condition and site will be acceptable for same use as pre-development. • Option would not significantly affect potential hazards associated with any existing contamination on site. • Option would not cause damage or loss to soil such that soil function and processes will not be affected. • Option would not affect land stability.
-	Negative	• Option would lead to an increase in pollutant discharges to soil, however these would be less than permitted limits, such that there will be minor short term increases in land contamination. • Option would cause minor increases in potential hazards associated with existing soil contamination. • Option would cause a temporary loss of soil so that soil function and processes would be negatively affected in the short/medium term. • Option will lead to an decrease in the versatility of the site so that there the site may be used for fewer potential uses than prior to development. (e.g. – a site that previously could be used for any employment use will be restricted to specific industrial use). • Option would cause minor short term negative effects on geological conservation sites/important geological features or soils of high importance.

Effect	Description	Illustrative Guidance
--	Significant negative	• Option would lead to a statutory limit being reached or exceeded in relation to land contamination, such that there would be a major and sustained increase in land contamination. • Option would cause major and sustained increases in potential hazards associated with existing soil contamination. • Option would cause considerable loss of soil quality, such that soil function and processes will be irreversibly and significantly affected. • Option will lead to an decrease in the versatility of the site so that there the site may be used for far fewer potential uses than prior to development (e.g. – a site that could be used for any purpose including agricultural uses is only available for specific industrial use). • Option would cause a substantial and permanent loss of or damage to soil of high importance and/or designated geological conservation sites/important geological features.
?	Uncertain	• From the level of information available the impact that the option would have on this objective is uncertain.

5.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the geology and soils objective. **Table 5.3** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 5.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 5.4** below.

Table 5.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than

Category	Assumption Description
	'greenfield' sites, although it is recognised that 'brownfield' land can be important for conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m$^{2.}$ Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2 . As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average).

Category	Assumption Description
	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine • It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since recycling a cleared submarine is little different to recycling a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be

Category	Assumption Description
	transported from the initial dismantling facility to the interim storage facility by sea, rail or road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Table 5.4** are considered in-turn below.

Stage I: Design and Develop Initial Submarine Dismantling Facilities Geology and Soils	
Option 1: Develop a Greenfield Site for Initial Submarine Dismantling	

Assessment of Effects:

It is generally expected that the scale of construction and amount of land take on a greenfield site will be greater than for the other options as it is assumed that all/most of the infrastructure and ancillary facilities required to support the initial dismantling facilities will be required. The significance of this effect will be exacerbated if the greenfield site includes designated geological conservation sites or important geological features, which due to the site being more extensive and on a coastal location is marginally more likely than for Options 2 and 3.

It is assumed that the site will be stripped of topsoil prior to construction works commencing to avoid damage to the soil and as a consequence, there will be a significant loss of soil. The severity of effect will depend on the soil type which as the options are not site specific is not possible to determine. Notwithstanding, it is more likely that soil types within a greenfield site will be of greater importance than the other options.

As soil quality is the 'soil's ability to provide ecosystem and social services through its capacities to perform its function under changing conditions', topsoil stripping will have an affect on soil function and process. Therefore, as Option 1 is expected to cause a greatest 'temporary' loss of top soil, it is also expected to have the greatest effect on soil function and processes.

Furthermore, as there will be greater need for invasive construction techniques, such as piling and dredging, it is expected that Option 1 may cause a small risk of land contamination from dust deposition, effluent discharge or through accidental spillage. It would be expected that any potential contamination would be sufficiently mitigated by following best practice guidance and through the use of a CEMP. However, it would not allow for accidental or unforeseen discharges.

There is a risk that any construction, demolition, or change of use may affect land stability, geomorphology and/or soil erosion rates, on- or off-site. The nature of the effects will depend on the geology and physical nature of the area, the size of the development and the extent to which dredging, piling and other invasive construction techniques are used.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF and it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). As a result the land take, loss of soil, invasive construction techniques and associated effects on soil function and processes, land contamination, stability, geomorphology or soil erosion is assumed to be the same across all of the technical options. However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage although this is not expected to alter the significance or scale of effects on this objective.

Proposed Mitigation / Enhancements Measures:

- Avoid development in locations in or within close proximity of geological SSSI features or geologically important/conservation sites.
- The site should be carefully stripped of topsoils prior to construction works commencing to avoid damage. All soils should be handled in suitable conditions (e.g. dry weather) and the most appropriate method of soil handling should be used. Soils should be stored in allocated heaps and protected from erosion, contamination or degradation. Different soil types should be stored separately and the length of time soils are stored should be minimised where possible. Soil excavation and mounds should avoid compaction where possible by making use of appropriate wide tracked vehicles and avoiding working on soil when it is wet. Appropriate drainage systems should be utilised on site to reduce soil erosion.
- Good practice guidance in the protection of soil materials should be followed: Good Practice for Handling Soils (Ministry of Agriculture, Fisheries and Food, 2000).

Summary: Option 1 has been assessed as having a significant negative affect in relation to this objective due to the scale of development necessary, the associated greenfield land take and the loss of soil. This intervention would affect soil functioning and processing. The significance of this effect would be exacerbated if the greenfield site includes designated geological conservation site or important geological feature which would be affected by the proposals. A greater scale of construction will increase the risk of accidental discharges.	--

Stage I: Design and Develop Initial Submarine Dismantling Facilities Geology and Soils	
For RC and RPV options construction of the size reduction facility would be delayed however, this is considered unlikely to alter the significance of effects on this objective.	

Option 2: Develop a Brownfield Site for Initial Submarine Dismantling

Assessment of Effects:

It is assumed that the majority of ancillary infrastructure would be in place to support the development of initial dismantling facilities such that the scale of construction would be less than that under Option 1. Therefore, land take and construction disturbance are likely to be less and, consequently, the impact on existing soil quality and function reduced.

It is also expected that the importance of soil type on a brownfield site will be less than that of soil of a greenfield site. The likelihood that the brownfield site includes a geologically important conservation is considered to be generally less than that of a greenfield site (unless the site were to include a former mineral working or quarry; however, this is considered highly unlikely).

Depending on the extent to which the brownfield site contains any soil contamination, there may be a preference for removing the topsoil from the site for treatment elsewhere. If this is the case, the potential effects on soil quality and function will also be affected.

Less invasive construction techniques will be required as the infrastructure needed for the development is of a smaller scale. In consequence, the risks of any further land contamination will be commensurately lower than those posed for Option 1. However, it would be expected that any potential contamination would be sufficiently mitigated by following best practice guidance and through the use of a CEMP. However, it would not allow for accidental or unforeseen discharges.

It is assumed that land stability would be unaffected by the proposals.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF and it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). As a result the land take, loss of soil, invasive construction techniques and associated effects on soil function and processes, land contamination, stability, geomorphology or soil erosion is assumed to be the same across all of the technical options. However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage although this is not expected to alter the significance or scale of effects on this objective.

Proposed Mitigation / Enhancements Measures:

- No additional mitigation measures proposed above those set out for Option 1.

Summary: Option 2 has been assessed as having a neutral effect on this objective. This is primarily due to the fact that land take under this option is expected to be small and the importance of soil type on brownfield land is likely to be low. The likelihood that the brownfield site includes a geologically important conservation is considered to be low. The anticipated scale of the construction activities will also decrease the risk of negative impacts on land stability and accidental discharge leading to soil contamination. For RC and RPV options construction of the size reduction facility would be delayed however, this is considered as unlikely to alter the significance of effects on this objective.	**0**

Option 3: Develop an Existing Licensed/Authorised Site for Initial Submarine Dismantling

Assessment of Effects:

It is assumed that at a Licensed/Authorised site sufficient infrastructure and ancillary facilities will be in place to accommodate initial dismantling

Stage I: Design and Develop Initial Submarine Dismantling Facilities

Geology and Soils

facilities such that the scale of construction would be less than that under Option 1 and Option 2. Therefore, land take and construction disturbance are likely to be less and, consequently, the impact on existing soil quality and function reduced.

It is also expected that the importance of soil type on a Licensed/Authorised site will be limited and it is assumed that the site will not contain any geologically important conservation areas.

Depending on the extent to which the Licensed/Authorised site contains any soil contamination, there may be a preference for removing the topsoil from the site for treatment elsewhere. If this is the case, the potential effects on soil quality and function will also be affected.

Invasive construction techniques should be minimal as the infrastructure needed for the development should be in place. In consequence, the risks of any further land contamination will also be minimal. However, it would be expected that any potential contamination would be sufficiently mitigated by following best practice guidance and through the use of a CEMP. However, it would not allow for accidental or unforeseen discharges.

It is assumed that land stability would be unaffected by the proposals.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF and it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). As a result the land take, loss of soil, invasive construction techniques and associated effects on soil function and processes, land contamination, stability, geomorphology or soil erosion is assumed to be the same across all of the technical options. However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage although this is not expected to alter the significance or scale of effects on this objective.

Proposed Mitigation / Enhancements Measures:

- No additional mitigation measures proposed above those set out for Option 1.

Summary: Option 3 has been assessed as having a neutral effect on this objective. This is primarily due to the fact that land take under this option is expected to be small and the importance of soil type on Authorised/Licensed sites is likely to be low. The likelihood that the Authorised/Licensed site includes a geologically important conservation is considered to be low. The anticipated scale of the construction activities will also decrease the risk of negative impacts on land stability and accidental discharge leading to soil contamination. For RC and RPV options construction of the size reduction facility would be delayed however, this is considered as unlikely to alter the significance of effects on this objective.	**0**

Stage II: Design and Develop the Interim ILW Storage Facility

Geology and Soils

Option 1: Develop a Greenfield Site for ILW Storage

Assessment of Effects:

Given the generic nature of the construction proposals for the interim storage facility, it is assumed that the potential effects associated with this objective will be largely similar as for Stage 1.

It is assumed that the site will be stripped of topsoil prior to construction works commencing to avoid damage to the soil and as a consequence, there will be a loss of soil. The severity of effect will depend on the soil type which as the options are not site specific is not possible to determine. Notwithstanding, it is more likely that soil types within a greenfield site will be of greater importance than the other options.

As part of the development of the interim storage facility there maybe a need for invasive construction techniques, such as drilling and piling (and dredging, required to maintain a navigable channel if the RC or RPV are moved to the storage site by sea). There is a small risk of land contamination from dust deposition, effluent discharge or through accidental spillage.

There is a risk that any construction may affect land stability, geomorphology and/or soil erosion rates, on- or off-site. The nature of the effects will depend on the geology and physical nature of the area, the size of the development and the extent to which dredging, piling and other invasive construction techniques are used.

It is generally expected that the scale of construction and amount of land take on a greenfield site will be greater than for the other options as it is assumed that all/most of the infrastructure and ancillary facilities as well as the storage facility itself will be required itself will be required, including but not restricted to; docks, rail head, roads, cranes, inspection and maintenance facilities and admin offices.

The significance of this effect will be exacerbated if the greenfield site includes designated geological conservation sites, important geological features or important soil types, which due to the site being more extensive and on a coastal location is marginally more likely than for Options 2 and 3.

As Option 1 is expected to cause a greatest loss of top soil, it is also expected to have the greatest effect on soil function and processes.

Technical Options:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

Storage of RCs will require construction of a relatively large facility together with docking facilities and dredging and therefore it is considered that it will result in the greatest loss of soil, and consequently the greatest affect on soil function and processes.

The need for structural reinforcement to support the substantial weight of RCs to avoid issues of structural instability will further increase total soil removal and the need for invasive construction techniques which will increase the risk of land contamination, as well as risks of negatively affecting land stability, geomorphology and soil erosion rates.

As transport by sea is the most likely mode to be utilised for the movement of RPVs to the interim storage facility, the RPV storage option will also require construction of docking facilities and dredging. As a result, RPV storage will require more invasive construction techniques and as a result has a greater potential to negatively affect this objective than the Packaged Waste option.

Due to the need to transport RC by sea, RC storage facilities may require dredging of the estuary to ensure the maintenance of an accessible channel to the existing docking facilities. This dredging activity has the potential to negatively affect land stability, geomorphology and soil erosion rates. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised).

Stage II: Design and Develop the Interim ILW Storage Facility Geology and Soils	
Proposed Mitigation / Enhancements Measures: • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.	
Summary: Option 1 has been assessed as having a negative effect in relation to this objective due to the greenfield land take and the loss of soil associated with construction of an interim storage facility on a greenfield site. This intervention would affect soil functioning and processing. The significance of this effect would also be exacerbated if the greenfield site includes designated geological conservation site or important geological feature which would be affected by the proposals. A greater scale of construction will increase the risk of accidental discharges. This negative effect has the *potential* to be significant should development comprise a RC storage facility given the increased footprint (including the requirement of a dock for receiving RCs and an internal rail line) and the need for structural reinforcement relative to RPV and Packaged Waste options.	**-/--**
Option 2: Develop a Brownfield Site for ILW Storage	
Assessment of Effects: It is assumed that the majority of ancillary infrastructure would be in place to support the development of an interim storage facility such that the scale of construction would be less than that under Option 1. Therefore, land take would be less and, consequently, the impact on existing soil quality and function reduced. It is also expected that the importance of soil type on a brownfield site will be less than that of soil of a greenfield site. The likelihood that the brownfield site includes a geologically important conservation is considered to be generally lower than that of a greenfield site (unless the site were to include a former mineral working or quarry; however, this is considered highly unlikely). Depending on the extent to which the brownfield site contains any soil contamination, there may be a preference for removing the topsoil from the site for treatment elsewhere. If this is the case, there maybe potential effects on soil quality and function. Less invasive construction techniques will be required as the infrastructure needed for the development is of a smaller scale. In consequence, the risks of any further land contamination will be commensurately lower than those posed for Option 1. It is assumed that land stability would be unaffected by the proposals. **Technical Options:** The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows: • RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas). • RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above. • Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure. Storage of RCs will require construction of a relatively large facility together with docking facilities and dredging and therefore it is considered that it will result in the greatest loss of soil, and consequently the greatest affect on soil function and processes. The need for structural reinforcement to support the substantial weight of RCs to avoid issues of structural instability will further increase total soil removal and the need for invasive construction techniques which will increase the risk of land contamination, as well as risks of negatively affecting land stability, geomorphology and soil erosion rates. As transport by sea is the most likely mode to be utilised for the movement of RPVs to the interim storage facility, the RPV storage option will	

Stage II: Design and Develop the Interim ILW Storage Facility

Geology and Soils

also require construction of docking facilities and dredging. As a result, RPV storage will require more invasive construction techniques and as a result has a greater potential to negatively affect this objective than the Packaged Waste option.

Due to the need to transport RC by sea, RC storage facilities may require dredging of the estuary to ensure the maintenance of an accessible channel to the existing docking facilities. However, the level of dredging required will be considerably less than for greenfield sites. This dredging activity has the potential to negatively affect land stability, geomorphology and soil erosion rates. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised).

Proposed Mitigation / Enhancements Measures:

- Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).

Summary: Option 2 has been assessed as having a neutral effect on this objective. This is primarily due to the fact that loss of soil under this option for all technical options is expected to be small and the importance of soil type on brownfield land is likely to be low. The likelihood that the brownfield site includes a geologically important conservation is considered to be low. Although the area footprint required and scale of construction will be greater for the RC option, it is still considered unlikely to have a negative impact on this objective. The anticipated scale of the construction activities will also decrease the risk of negative impacts on land stability and accidental discharge leading to soil contamination.	**0**

Option 3: Develop an Existing Licensed/Authorised Site for ILW Storage

Assessment of Effects:

It is assumed that at a Licensed/Authorised site sufficient infrastructure and ancillary facilities will be in place to accommodate an interim storage facility such that the scale of construction would be less than that under Option 1 and Option 2. Therefore, land take and construction disturbance are likely to be less and, consequently, the impact on existing soil quality and function reduced.

It is also expected that the importance of soil type on a Licensed/Authorised site will be limited and it is assumed that the site will not contain any geologically important conservation areas.

It is expected that there will be levels of existing soil contamination present on a Licensed/Authorised site; however, they are considered likely to be less than those on a brownfield site and therefore the volumes of topsoil removed from the site for treatment elsewhere and its potential effect on soil quality and function is likely to be less than that for Option 2.

It is assumed that land stability would be unaffected by the proposals.

Technical Option:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar. However, as the docks are expected to already be in use at Licensed/Authorised sites it is anticipated that the level of dredging required under RC and RPV storage options and potential negative effects may be less than for brownfield sites.

Stage II: Design and Develop the Interim ILW Storage Facility Geology and Soils	
Proposed Mitigation / Enhancements Measures: • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of a dismantling facility).	
Summary: Option 3 has been assessed as having a neutral effect on this objective. This is primarily due to the fact that loss of soil under this option is expected to be small and the importance of soil type on Authorised/Licensed sites is likely to be low. The likelihood that the Licensed/Authorised site includes a geologically important conservation is considered to be low. Although the area footprint required and scale of construction will be greater for RC storage than either RPV or Packaged Waste options, it is still considered unlikely to have a negative impact on this objective. The anticipated scale of the construction activities will also decrease the risk of negative impacts on land stability and accidental discharge leading to soil contamination.	**0**

Stage III: Dock Submarines and Remove the Radioactive Materials

Geology and Soils

Option 1: Reactor Compartment Separation

Assessment of Effects:

Pollutant pathways leading to potential effects on soil quality could be either through contact with contaminated water or through deposition of contaminated particulates. Potential effects on soil will therefore be related to emissions to air and any discharges to water. It will also be affected by the proximity to any soil resource and its quality.

All three technical options (RC, RPV and Packaged Waste) involve common life cycle activities and although there will be minor differences depending on the exact techniques employed, it is assumed that the radioactive and non-radioactive discharges from operations will be minimal across all options and will remain well below statutory levels (being subject to stringent environmental permitting requirements with Best Available Techniques (BAT) principles adopted). There is the potential for impacts, e.g. accidental release of pollutants and radioactive material during initial dismantling including accidental release of untreated discharges or uncontrolled flooding or dewatering in the Dock Bottom Village (DBV). The risk of a credible unplanned release of radioactivity into the environment will intuitively increase in proportion to the extent of dismantling, although strict legal controls are in place to prevent such events from occurring. As RC separation is the least intrusive of the technical options and allows for further natural radioactive decay prior to size reduction, the already very low risk of any accidental discharge or hazardous materials would be the lowest of the three technical options.

In consequence, the probability of any such discharges having an impact on soil/geology will be very low as the likelihood of any pollutant event is very low, and the level of intrusive activities relatively small. However, if the safeguards were to fail there could be potentially a significant negative impact on soil and sediments, the magnitude of the effect would depend on the quality of and importance of soil in surrounding areas and proximity to geological SSSI features or regional important geological sites.

Proposed Mitigation / Enhancements Measures:

- Environmental containment will be provided through a temporary structure with a high efficiency, filtered extract ventilation system.

Summary:	**0**
Option 1 has been assessed as having a neutral effect in relation to this objective as the probability of any discharges having an impact on soil/geology will be very low. Although the likelihood of accidental discharges is considered to be remote, in such an event there could be a potentially significant negative effect on soil and sediment, depending upon the quality and importance of soil surrounding the site and proximity to geological SSSI features or regionally important geological sites.	

Option 2: Reactor Pressure Vessel Removal

Assessment of Effects:

Routine discharges are expected to be greater under this option than for Options 1 as the RPV option involves additional intrusive activities to remove the RPV from the submarine hull. Such activities will be subject to stringent environmental permitting requirements with BAT principles adopted to ensure best practices are employed. For example, a high efficiency, filtered extraction ventilation system for RPV removal work should prevent discharges of dust and particulates. There may also be additional risks associated with the movement of LLW to the LLWR and hazardous waste for example, as a result of fire or collision.

Similar to the RC option, the RPV option allows for the in-situ decay of short lived isotopes.

It is considered that the probability of any such discharges having a significant impact on soil/geology will be very low given that operation activities will be closely regulated and subject to stringent Health and Safety, Best Available Techniques (BAT) and Environmental Permitting requirements. However, if the safeguards were to fail there could be potentially a significant negative impact on soil and sediments, the magnitude of the effect would depend on the quality of and importance of soil in surrounding areas and proximity to geological SSSI features or regional important geological sites.

Stage III: Dock Submarines and Remove the Radioactive Materials **Geology and Soils**	
Proposed Mitigation / Enhancements Measures: • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a neutral effect in relation to this objective as the probability of any discharges having an impact on soil/geology will be very low. Although the likelihood of accidental discharges is considered to be remote, in such an event there could be a potentially significant negative effect on soil and sediment, depending upon the quality and importance of soil surrounding the site and proximity to geological SSSI features or regionally important geological sites.	**0**
Option 3: Reactor Pressure Vessel Removal and Size Reduction for Storage as Packaged Waste	
Assessment of Effects: Under Option 3, RC dismantling to packaged waste will be undertaken up front. This will decrease the time available for decay of short lived isotopes and could lead to higher potential planned and unplanned radiological discharges when compared to any option that involves storage of either the RC or RPV. However, whilst there is the potential for operational activities to impact on soil and geology, it is assumed that the any discharges will be minimal and will remain well below statutory levels (being subject to stringent environmental permitting requirements with Best Available Techniques (BAT) principles adopted). That being said, if the safeguards were to fail there could be potentially a significant negative impact on soil and sediments, the magnitude of the effect would depend on the quality of and importance of soil in surrounding areas and proximity to geological SSSI features or regional important geological sites. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a neutral effect in relation to this objective as the probability of any discharges having an impact on soil/geology will be very low. Although the likelihood of accidental discharges is considered to be remote, in such an event there could be a potentially significant negative effect on soil and sediment, depending upon the quality and importance of soil surrounding the site and proximity to geological SSSI features or regionally important geological sites.	**0**

Stage IV: Dismantle the Residual Submarine Hulls, and Process Wastes

Geology and Soils

All Options

Assessment of Effects:

It is assumed that the submarines will have already been drained of the majority of liquids (such as oils, lubricating fluids, coolants and hydraulic fluids) prior to long term storage at the lay-off position. However, there is the possibility that residual liquids remaining within the submarine and these will be removed during the preparation of submarines for dismantling process. During the transfer of these liquids to secure containers, and whilst in storage, there is the potential for an accidental release of these contaminants. Whilst it is anticipated that there will be a number of measures to minimise any adverse effects (whether through the use of spill kits, or through oil traps), there remains the potential that these liquids or contaminated water could infiltrate soil adjacent to the initial dismantling facility. However, the likelihood of such an event occurring is considered very low, given the environmental standards that will be in place (such as environmental permitting requirements, application of BAT and the use of environmental containment and safeguards). Furthermore, given the small volumes considered to be remaining in the submarine should such a release occur it is considered that it is unlikely to have a significantly negative effect on soil.

There is a potential risk from accidental discharge of potential contaminants (including fuel, oil and any remaining hazardous material) during the movement of the submarine from the initial dismantling facility to the ship recycling facility that could have a negative effect on seabed sediment and coastlines. However, it is considered that any such risk is remote as submarines will have undergone preparation for safe transportation, including watertight integrity. In the event of an accident (a collision event, submarine grounding or a major fire event), submarine movement could also have an adverse effect on seabed sediment or coastlines. However, the likelihood of any occurring is very small. The risks associated with the movement will depend upon total distance travelled, the route of movement, and the choice of transport method.

Hazardous wastes may be generated during the preparation process, such as chromate paints during shot blasting or asbestos during removal of insulating materials. These would need to be handled in compliance with relevant waste regulations. In the case of asbestos it is assumed that specialised licensed contractors will be utilised for its disposal. Environmental containment measures will be used to ensure that any dust and particulate matter associated with the removal of these materials will not be released (and so could eventually be deposited on open land and soils). Similarly safeguards would be in place to prevent any accidental discharges of stored solid hazardous materials from leaving either the dismantling or ship recycling sites and impacting on surrounding soil/geology. As a result, it is considered unlikely that there will be any significant impact from accidental discharges. However, if the safeguards were to fail there could be potentially a significant negative impact on soil and sediments; the magnitude of such effect would depend on the quality of and importance of soil in surrounding areas and proximity to geological SSSI features or regional important geological sites.

It is assumed that activities and techniques associated with submarine recycling will be similar to those already occurring at the existing ship recycling facility and as it will already be subject to regulatory requirements to ensure environmental standards are met, therefore the risk of any breach to these standards is very low. For example, it is assumed that safeguards would be in place to prevent any accidental discharges from reaching soil receptors. Therefore, it is assumed that there will be no expected negative effects on soil or geology related to the ship recycling activities.

Proposed Mitigation / Enhancements Measures:

- Environmental containment will be provided through a temporary structure with a high efficiency, filtered extract ventilation system.
- Use Environment Management Plan (EMP) and appropriate measures to minimise emissions of pollutants to water, for example, decanting waste liquids from the de-pollution process into the appropriate and approved waste containers for controlled disposal

Summary: This stage has been assessed as having a neutral effect in relation to this objective. Although, preparatory works and recycling of submarines is likely to result in multiple sources of hazardous wastes, including asbestos and chromate paints, it is considered that precautions will be in place to ensure safe disposal (such as specialist asbestos contractors) and likelihood of contamination of soil is remote (given that environmental permitting requirements, BAT and best practice will be followed).	**0**

Stage V: Transport the RC/RPV/ILW to Interim Storage Geology and Soils	
Option 1: Reactor Compartment Transport to Interim Storage	
Assessment of Effects: The effects of this option (which includes interim ILW storage itself) on geology and soils depends on how far the RC has to travel. If it is kept at or adjacent to the initial dismantling facility (known as the 'point of waste generation') then effects would be minimal. However, if RCs were taken to another coastal location to be stored, the effects could be more pronounced. This assessment has therefore assessed the impacts of moving the RC offsite to ensure that all potential effects are identified. The RC will contain ILW and there is *potential* for some mobile liquids, such as sludge and tritium, (i.e. – Stage 3) although the likelihood of this is small. However, it is assumed that the RC will be sealed prior to transportation and would meet which with ILW regulators requirements, both of which would decrease the risk of discharges. The risk of accidental discharge will depend upon the distance travelled and the route taken which as the location of the initial dismantling facility and interim storage site remains uncertain. During RC storage, the risk of accidental discharge of radiological contaminants is also considered to be extremely low as the integrity of RCs will be regularly inspected and maintained. There remains a risk of an unplanned incident such as a major fire at the interim storage facility resulting in the release of radiological contaminants. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. If safeguards were to fail then there could be a significantly negative impact on soil quality from the deposition of contaminants from any such fire. The significance of such an effect will depend upon location, proximity to geologically important areas, the existing soil quality and volumes discharged. **Proposed Mitigation / Enhancements Measures:** • Emergency response plan to address any potential unplanned events	
Summary: Option 1 has been assessed as having a neutral effect on this objective. This is primarily because the risks of breaching the RC during transportation or interim storage and this resulting in accidental discharge reaching soil is considered very low.	**0**
Option 2: Reactor Pressure Vessel Transport to Interim Storage	
Assessment of Effects The RPV will contain ILW and there is potential for mobile liquids, such as sludge and tritium, since it is recognised that these cannot be drained completely in the processing stage (i.e. – stage 3) although the likelihood of this is small. However, it is assumed that the RPV will be sealed and packed within a container specifically developed for transportation and storage and would meet which with ILW regulators requirements, both of which would decrease the risk of discharges. The risk of accidental discharge will depend upon the distance travelled and the route taken which as the location of the initial dismantling facility and storage site is unknown remains uncertain. The sealing and packaging of a vessel to store RPV will be designed to minimise the possibility of any radiological discharge from a breach to the container during transport and interim storage. During RPV storage, the risk of accidental discharge of radiological contaminants is also considered to be extremely low as the integrity of RPVs will be regularly inspected and maintained. There remains a risk of an unplanned incident such as a major fire at the interim storage facility resulting in the release of radiological contaminants. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. If safeguards were to fail then there could be a significantly negative impact on soil quality from the deposition of contaminants from any such fire. The significance of such an effect will depend upon location, proximity to geologically important areas, the existing soil quality and volumes discharged.	

Stage V: Transport the RC/RPV/ILW to Interim Storage Geology and Soils	
Proposed Mitigation / Enhancements Measures • Emergency response plan to address any potential unplanned events	
Summary: Option 2 has been assessed as having a neutral effect on this objective. The risks of accidental discharges reaching soil/seabed sediments and impacting on this objective are extremely low.	**0**
Option 3: Packaged Waste Transport to Interim Storage	
Assessment of Effects: Given that the packaged waste will largely comprise of cut up steel, immobilised within a grout, any radiological discharge associated with the movement of each container will be exceptionally low. No liquid ILW will be transported. The potential for any radiological and non radiological discharges from the storage of the packaged waste is considered exceptionally low given the containment of any potentially hazardous material within containers compatible with the proposed GDF. There remains a risk of an unplanned incident during transportation or at the interim storage facility which could have a significant negative effect on the health and wellbeing of workers and the public. However, for contaminants to be released, necessary conditions would have to exist for the waste to become mobilised (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. If safeguards were to fail then there could be a significantly negative impact on soil quality from the deposition of contaminants from any such fire. The significance of such an effect will depend upon location, proximity to geologically important areas, the existing soil quality and volumes discharged. **Proposed Mitigation / Enhancements Measures** • Emergency response plan to address any potential unplanned events	
Summary: Option 3 has been assessed as having a neutral effect on this objective. The risks of accidental discharges reaching soil/seabed sediments and impacting on this objective are extremely low.	**0**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Geology and Soils	
Option 1: Size Reduce the Reactor Compartment and Transfer Packaged Waste to the Proposed GDF	
Assessment of Effects: Depending on where the RCs are stored and where they are to be finally dismantled, there may be a requirement to transport RCs. It is expected due to the size and weight of RC that this will only occur by sea and by barge or heavy lift vessel. As RCs will be sealed (in accordance with the Transport Regulations), it is not expected that there will be any discharge of radiological contaminants. It is also assumed that RCs would be passively safe (i.e. all liquids and potentially mobile radioactive materials would be removed or immobilised) and as such it is not expected that there will be any risk of accidental discharge of radiological contaminants during transportation. It is assumed that the radioactive and non-radioactive discharges from operations will be minimal across all options and will remain well below statutory levels (being subject to stringent environmental permitting requirements with BAT principles adopted). For example, a high efficiency, filtered extraction ventilation system for RPV removal work should prevent discharges of dust and particulates. Routine discharges are expected to be greater under this option than for Options 2 and 3 during this stage of the SDP process primarily due to the requirement for removal of RC components (for Options 2 and 3 these works would have been undertaken during Stage 3). However, as set out under the assessment of this option for Stage 3, the delay in works will result in a reduction of the total activity that could potentially be discharged to the environment during normal operations. In addition, delay (given that it will be at least 30 years before RPV removal and size reduction begins) may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the BAT), which should ensure that future operational discharges of both radiological emissions and non-radiological emissions will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. There is the potential for impacts (e.g. accidental release of pollutants and radioactive material) during RPV removal, including accidental release of untreated discharges. Pollutant pathways leading to potential effects on soil quality could be either through contact with contaminated water or through deposition of contaminated particulates. Potential effects on soil will therefore be related to emissions to air and any discharges to water. It will also be affected by the proximity to any soil resource and its quality. However, for all activities it is assumed that safeguards would be in place to prevent any accidental radioactive and non-radioactive discharges from reaching an environmental receptor and operational activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. Overall therefore, it is considered exceptionally unlikely that there will be any significant impact on geology and soils from accidental discharges. As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated risks on adjacent sensitive receptors, there is only a remote likelihood of any accidental discharges during transport. Therefore it is determined that transportation of packaged waste is not expected to pose any effect to geology and soils, under normal operating circumstances. Once the RPV has been removed the remaining RC casing which is expected to be non radioactive will be cut up and size reduced on site. All items removed or size reduced from the RC casing will be monitored, characterised and transferred to a suitable waste processing facility for recycling or disposal as appropriate. However, it is uncertain as to where the cut up and size reduction of the RC casing will take place within the SDP site and subsequently the level of shielding that will be provided. Nonetheless the generation of any emissions from this activity is unlikely to be greater than that already experienced from other activities within the SDP site and consequently unlikely to have an adverse effect when compared to the current baseline. **Proposed Mitigation / Enhancements Measures:** • Environmental containment will be provided through a segregation facility with a high efficiency, filtered extract ventilation system.	
Summary: Option 1 has been assessed as having a neutral effect in relation to this objective as the probability of any discharges having an impact on soil/geology will be very low. Although the likelihood of accidental discharges is considered to be remote, in such an event there could be a potentially significant negative effect on soil and sediment, depending upon the quality and importance of soil surrounding the site and proximity to geological SSSI features or regionally important geological sites.	**0**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF **Geology and Soils**	
Option 2: Size Reduce the Reactor Pressure Vessel and Transfer Packaged Waste to the Proposed GDF	
Assessment of Effects: The type and range of potential effects on biodiversity under this option are expected to be broadly similar to those associated with Option 1. However, the risk of a credible unplanned release into the environment will decrease as the scale of works associated with this option is less than for Option 1 (as the removal of RC components will have been undertaken during Stage 3 of the SDP process) with dismantling of the RPV to packaged waste taking place inside a size reduction facility which is expected to contain any discharges should they arise. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a neutral effect in relation to this objective as the probability of any discharges having an impact on soil/geology will be very low. Although the likelihood of accidental discharges is considered to be remote, in such an event there could be a potentially significant negative effect on soil and sediment, depending upon the quality and importance of soil surrounding the site and proximity to geological SSSI features or regionally important geological sites.	**0**
Option 3: Transport Packaged Waste to the Proposed GDF	
Assessment of Effects: Under this option all dismantling and packaging activities will have been undertaken up front and transporting the packaged waste to the proposed GDF is not expected to have any affect on geology and soils, under normal operating circumstances. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a neutral effect in relation to this objective as there are no additional processing activities associated with the option beyond the transportation of packaged waste to the proposed GDF. Any risks of accidental discharges from transport are considered exceptionally small.	**0**

Stage VII: Decommission SDP Facilities

Geology and Soils

Option 1: Decommission Greenfield Sites

Assessment of Effects:

It is generally expected that the scale of demolition of facilities built on greenfield land will be greater than for the other options as it is assumed that all/most of the infrastructure and ancillary facilities as well as the dismantling/size reduction and interim storage facilities will be required to be demolished.

Furthermore in order to restore the land to its original greenfield state, all hardstanding will need to be removed increasing the levels of land excavation required. Due to the increased need for invasive demolition techniques and land excavation required, there is an increased risk of negatively affecting land stability, geomorphology and/or soil erosion for Option 1 during demolition activities than for the other generic land use options.

The increased scale of demolition required to remove buildings and infrastructure in order to restore to a greenfield site will also increase the risk of land contamination from dust deposition, effluent discharge or through accidental spillage, compared to Options 2 and 3.

Decommissioning activities will involve the demolition, excavation, movement and treatment of radiologically contaminated material, particularly arising from the size reduction facility (e.g. the hot cell). Most radiologically contaminated materials are expected to be solid, comprising a selection of concrete and cut up apparatus such as pipes and cladding although there is some potential that small amounts of liquids (crud and sludge) from the effluent treatment plant will be present, the discharge of which could significantly impact upon soil quality. However, it is assumed that all activities will be subject to BAT and ALARP and that containment mechanisms would be in place to prevent discharge to the environment. There is a potential risk of accidental discharge of radiation during decommissioning although the probability of any such discharges having a significant impact on soils will be low given that decommissioning activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. These requirements will ensure that any discharges to the environment are both minimised, and within the limits defined in the site permit.

It would be expected that any potential non-radiological contamination would be sufficiently mitigated by following best practice guidance and through the implementation of an EMP, although this would not allow for accidental or unforeseen discharges. However, as part of the decommissioning activities it is assumed that any land contamination on site or the surrounding areas from either operation of the site or decommissioning activities will be treated and returned to its original state through land remediation processes.

It is assumed that as part of the restoration of SDP sites the topsoil removed during development and stored in bunds during operation will be returned, improving soil quality from the low levels found during operation by restoring sites to their original greenfield state and soil function/processes.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim ILW storage facility compared to RPV and Packaged Waste options and, on a greenfield site, removal of docking facilities would also be required. Therefore, it is expected that for the RC option there would be an increased need for invasive demolition techniques and land excavation, increasing the risk of negatively affecting land stability, geomorphology and/or soil erosion relative to RPV and Packaged Waste options. The increased scale of demolition required may also increase the risk of land contamination from dust deposition, effluent discharge or through accidental spillage.

Proposed Mitigation / Enhancements Measures:

- Development of a site wide Environmental Management Plan

Summary: Option 1 has been assessed as having a long term positive effect on this objective as topsoil removed from sites during development and stored in bunds during operation will be returned, restoring SDP sites from a low soil quality during operation	**0/+**

Stage VII: Decommission SDP Facilities

Geology and Soils

to their greenfield condition and soil function/processes found on site prior to development.

The potential for negatively affecting land stability, geomorphology and/or soil erosion or contaminating land in the short to medium term during demolition stages of decommissioning will be greater for Option 1 than the other generic land use options due to the increased scale of demolition required. Similarly the RC option will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste options and consequently there would be an increased risk of negatively affecting land stability, geomorphology and/or soil erosion. The increased scale of demolition required may also increase the risk of land contamination from dust deposition, effluent discharge or through accidental spillage. However, these risks are small, especially as best practice guidance and an EMP will be followed. Furthermore, any land contamination that occurs during demolition activities, or previously through the operation of the sites, will be treated through land remediation during the later decommissioning activities.

Option 2: Decommission Brownfield Sites

Assessment of Effects:

Given that the majority of ancillary infrastructure, such as roads or rail head and docking facilities and much of the hardstanding would have been present at a brownfield site prior to development, it is expected that the scale of demolition and land excavation required to restore SDP sites to their previous condition would be less than under Option 1. The associated demolition/land excavation disturbance would also be expected to be less and for a shorter duration, consequently, the potential for negatively affecting land stability, geomorphology, soil erosion or contaminating land will be less than for the Option 1. It is assumed any associated risks will be low, as best practice guidance will be followed and an EMP will be used to sufficiently mitigate any potential contamination from decommissioning activities. Furthermore, any land that is contaminated as a result of any of the stages of SDP, including operation and demolition of sites, is expected to be treated through land remediation as a part of the decommissioning process.

Decommissioning activities will involve the demolition, excavation, movement and treatment of radiologically contaminated material, particularly arising from the size reduction facility (e.g. the hot cell). Most radiologically contaminated materials are expected to be solid, comprising a selection of concrete and cut up apparatus such as pipes and cladding although there is some potential that small amounts of liquids (crud and sludge) from the effluent treatment plant will be present, the discharge of which could significantly impact upon soil quality. However, it is assumed that all activities will be subject to BAT and ALARP and that containment mechanisms would be in place to prevent discharge to the environment. There is a potential risk of accidental discharge of radiation during decommissioning although the probability of any such discharges having a significant impact on soils will be low given that decommissioning activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. These requirements will ensure that any discharges to the environment are both minimised, and within the limits defined in the site permit.

It is assumed that as part of the restoration of SDP sites any topsoil removed during development and stored in bunds during operation will be returned and will restore the sites to their original soil function/processes. Depending on the extent to which the brownfield site contained any soil contamination prior to development, there may be an opportunity to improve the soil quality to a greater level than that prior to development. This may be through either in-situ treatment through land remediation during decommissioning or by returning previously contaminated land that has been removed during developed and treated elsewhere back to the site.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim ILW storage facility compared to RPV and Packaged Waste options. Therefore, it is expected that for the RC option there would be an increased need for invasive demolition techniques and land excavation, increasing the risk of negatively affecting land stability, geomorphology and/or soil erosion relative to RPV and Packaged Waste options. The increased scale of demolition required may also increase the risk of land contamination from dust deposition, effluent discharge or through accidental spillage.

Stage VII: Decommission SDP Facilities Geology and Soils	
Proposed Mitigation / Enhancements Measures: • No additional measures beyond those proposed for Option 1.	
Summary: Option 2 has been assessed as having a long term positive effect on this objective. This is primarily due to the fact that any land contamination expected to occur as a result of any of the stages of the SDP process will be treated during land remediation and topsoil removed from the site during development and stored in bunds during operation will be returned thereby improving soil quality by restoring the sites' soil quality and function/processes. There is also an opportunity to improve soil quality beyond previous levels, depending on the extent of land contamination prior to development, through land remediation on site during decommissioning or through restoring treated contaminated soil removed from site during development. The potential for negatively affecting land stability, geomorphology , soil erosion or contaminating land during demolition stages of decommissioning will be less for Option 2 than Option 1 due to the decreased scale of demolition required. RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste options and consequently there would be an increased risk of negatively affecting land stability, geomorphology and/or soil erosion. The increased scale of demolition required may also increase the risk of land contamination from dust deposition, effluent discharge or through accidental spillage. However, these risks are small, especially as best practice guidance and an EMP will be followed. Furthermore, any land contamination that occurs during demolition activities, or previously through the operation of the sites, will be treated through land remediation during the later decommissioning activities.	**0/+**
Option 3: Decommission Existing Licensed/Authorised Sites	
Assessment of Effects: The scale of demolition and land excavation required to restore a Licensed/Authorised site back to its original state will be less than for the other generic land use options as all infrastructure, ancillary facilities and hardstanding are expected to have been present at the sites prior to development and will therefore not require removal. As a result, the potential for negatively affecting land stability, geomorphology, soil erosion or contaminating land will be less than for the other generic land use options. Decommissioning activities will involve the demolition, excavation, movement and treatment of radiologically contaminated material, particularly arising from the size reduction facility (e.g. the hot cell). Most radiologically contaminated materials are expected to be solid, comprising a selection of concrete and cut up apparatus such as pipes and cladding although there is some potential that small amounts of liquids (crud and sludge) from the effluent treatment plant will be present, the discharge of which could significantly impact upon soil quality. However, it is assumed that all activities will be subject to BAT and ALARP and that containment mechanisms would be in place to prevent discharge to the environment. There is a potential risk of accidental discharge of radiation during decommissioning although the probability of any such discharges having a significant impact on soils will be low given that decommissioning activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. These requirements will ensure that any discharges to the environment are both minimised, and within the limits defined in the site permit. Depending on the extent to which the Licensed/Authorised site contained any soil contamination prior to development, there may be an opportunity to improve the soil quality to a greater level This may be achieved through either in-situ treatment through land remediation during decommissioning or by returning previously contaminated land that has been removed during development and treated ex-situ back to the site. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence of the technical options on	

Stage VII: Decommission SDP Facilities Geology and Soils	
their severity is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: Option 3 has been assessed as having a long term positive effect on this objective. This is primarily due to the fact that any land contamination expected to occur as a result of any of the stages of the SDP process will be treated during land remediation and that soil will be restored to the same quality as that prior to development. There may also be the opportunity to improve the soil quality beyond previous levels, depending on the extent of land contamination prior to development, through land remediation on site during decommissioning or through restoring treated contaminated soil removed from site during development. The potential for negatively affecting land stability, geomorphology, soil erosion or contaminating land during demolition stages of decommissioning will be less for Option 3 than the other generic land use options due to the decreased scale of demolition required. The RC option will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste options and consequently there would be an increased risk of negatively affecting land stability, geomorphology and/or soil erosion. The increased scale of demolition required may also increase the risk of land contamination from dust deposition, effluent discharge or through accidental spillage. However, these risks are small, especially as best practice guidance and an EMP will be followed. Furthermore, any land contamination that occurs during demolition activities, or previously through the operation of the sites, will be treated through land remediation during the later decommissioning activities.	**0/+**

5.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the geology and soils objective. **Box 5.2** provides a summary of the options that have been assessed.

Box 2.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 5.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources.	-/?	-/?	-/?	**Potential Effects** No effects on geological conservation sites or important geological features are anticipated as a result of SDP activities within the dockyards, as the Devonport and Rosyth dockyards do not contain any areas of geological interest *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The Devonport and Rosyth dockyards are well established dockyards, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. Modifications to existing facilities and the development of new facilities at the Devonport and Rosyth dockyards is therefore unlikely to have a significant impact on soil resource and function, although there may be some localised disturbance from intrusive ground works such as piling (if required). There is a risk of new pollution pathways being created for any existing contaminants on the dockyards during construction, e.g. any intrusive ground works such as piling. There is also a risk of soil contamination from dust deposition, effluent discharge or through accidental spillage (including via air or water) during SDP activities, e.g. accidental release of pollutants during construction such as silty run-off or spilled fuel and oils; and accidental release of pollutants and radioactive material during initial dismantling (RC cut out) and segregation and size reduction (full dismantling of the RC following interim storage) operations, including accidental release of untreated discharges *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations. SDP activities are not anticipated to affect land stability *(refer to impacts specific to the Devonport and Rosyth dockyards).* There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. It is expected that submarines will be wet towed into the dockyard. In the unlikely event that submarines are transported using a heavy left vessel, there is the potential for any dredging and channel modification to have an effect on sea bed function and processes, and mobilise existing contamination, due to the physical displacement of the estuary bed. There is the potential for sediment within estuary channels to be contaminated with a range of potential pollutants (e.g. heavy metals, organics including pesticides, PCBs and nutrients) from municipal, industrial and agricultural sources, although the current levels of contamination are unknown (refer to impacts specific to the Devonport and Rosyth dockyards). Of the technical options, taking account of interim storage requirements the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2 and, in consequence, the potential for any impact on soils during construction could be greater. However, construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only.

Assessment Criteria	Score			Commentary
	1D	1R	1B	
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	Construction of facilities for size reduction of the RC would not take place until the interim storage period is nearing completion. Separating activities into two phases may help to minimise any impacts on soils. However, it could also be argued that two periods of activity rather than one could be more disruptive, due to the extended time period over which effects could occur. Although in the case of all of the technical options, as BAT principles would be adopted and the risk of accidental discharge is considered to be very low, no significant impacts on geology or soils are anticipated. The need for reinforcement to support the substantial weight loading of RCs (assumed to weigh approximately 1,000 tonnes each) to avoid issues of structural instability would increase the need for invasive construction techniques for this option, which would in turn increase the risk of land contamination, as well as risks of negatively affecting land stability, geomorphology and soil erosion rates when compared to the other technical options. The RC option is considered to carry the least risk of unplanned release of radioactive material associated with initial dismantling, as radioactive waste would be contained within the RC. However, as the entire RC would be cut-out of the submarine, with the fore and aft sections subsequently requiring significant welding to seal them for transport, there would be greater potential for the release of non-radiological pollutants to the environment at this stage when compared to the other options. Notwithstanding this, as the RC option allows for the in-situ decay of short lived isotopes, following interim storage radioactivity levels would have reduced, resulting in a reduction in potential sources of radiological discharge. Subsequent segregation and size reduction is therefore considered to be less of a pollution risk than the PW option. However, the RC would need to be placed back into the DBV to remove the RPV, increasing the potential for accidental discharges into the basin when compared to the other technical options, which do not require use of the DBV following initial dismantling. The delay from interim storage before size reduction begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. Devonport Dockyard There are no geological conservation sites or important geological features in Devonport dockyard. However, there are two geological sites located on the shoreline downstream of the dockyard: Mount Wise geological SSSI (a site within the Plymouth Limestone Group which comprises a discontinuous horizon rich in shelly remains of importance), which is located approx 2.5km to the south-east of Devonport dockyard; and Western King geological SSSI (a complex series of Devonian Limestones), located approx. 3.4km to the south-east of the dockyard. Both geological SSSI's were classified by Natural England as being in unfavourable but recovering condition. Taking account of the location of Devonport dockyard over 2km upstream of these geological SSSIs and the scale and nature of SDP activities to be undertaken, it is not anticipated that SDP activities would impact on the geological SSSIs. There may be the potential for adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water), although this is considered very unlikely.

Assessment Criteria	Score			Commentary
	1D	1R	1B	
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	Devonport dockyard is underlain by alluvium above Upper Devonian Slate. The dockyard is primarily made of reclaimed ground. Fill material may have a high heavy metal content, often having been imported as ballast from mining areas further up the Tamar estuaries. Various contaminated land surveys were conducted during the construction phase of the recent modernisation and enhancement works. Localised contamination due to particular activities was detected, such as around the galvanising tanks of the old smithy. Lead, copper nickel and zinc levels were generally sufficiently high to require careful consideration of disposal routes. Modifications to existing facilities and the construction of new facilities within the Devonport dockyard could mobilise existing contaminants and create new pollution pathways for existing contaminants on the dockyard (e.g. piling and other intrusive construction techniques). However, any risk would be managed through a CEMP using BAT, which would ensure that any mobilisation of contaminants is controlled and therefore there would be minimal risk of significant effects during normal operations. The SDP may create opportunities to remediate existing areas of contaminated as part of construction, however this is uncertain. It is unknown whether SDP activities within Devonport dockyard would affect land stability. This requires further investigation. However, taking account of the nature of SDP activities, which are similar to those currently being undertaken, it is considered that SDP activities are unlikely to significantly increase any risk of land instability. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. In the unlikely event that submarines are transported using heavy lift vessel significant dredging and channel modification would be required to create sufficient deep water (an estimated 300m wide area to a depth of 22-25+ metres would be required for heavy lift operations). The depth of water in those areas of Plymouth Sound that could be appropriate for heavy lift operations is estimated to be 15m. Taking account of this depth, dredging to 10m to create an area up to 25m deep and 300m wide would produce approx. 706,000 tonnes of dredged material. Sediment and bedrock depth is currently unknown. However, the depth to bedrock in Plymouth Sound has previously been reported as -39mOD. In the unlikely event that bedrock is encountered blasting would also need to be undertaken. Previous studies have determined that polycyclic aromatic hydrocarbons (PAHs), principally from urban run-off, combustion and dockyard activities, are major contaminants in the lower part of the Tamar estuary. At present, only very small amounts of maintenance dredging is undertaken at the dockyard each year. Maintenance dredging in the Lower Tamar is reported to account for the annual removal of 5,000 to 200,000 tonnes of sediment per year (based on tonnes of sediment dredged from the Tamar between 1985 and 2001). The dredging required for heavy lift operations would therefore be significant when compared to current dredging operations There is the potential for dredging to negatively impact on soil function and processes, and estuary morphology (e.g. alteration of sediment pathways and changes to siltation patterns) due to the removal of substantial volumes of sea bed sediment. There could also be the potential for dredging to mobilise contaminated sediment on the estuary bed, although current levels of contamination are unknown. <u>Rosyth Dockyard</u> There are no geological conservation sites or important geological features in Devonport dockyard. The nearest designated geological site is understood to be the Firth of Forth SSSI located approx. 0.3km to the west of Rosyth dockyard at its closest point.
E. Geology and Soils Minimise threats to the extent and quality of soils	-/?	-/?	-/?	Taking account of the scale and nature of SDP activities to be undertaken, it is not anticipated that SDP activities would impact on the Firth of Forth geological SSSI. There may be the potential for adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water), although this is considered very unlikely.

Assessment Criteria	Score			Commentary
	1D	1R	1B	
and geological resources. *(continued)*				Rosyth dockyard is predominantly underlain by sedimentary rock of the Sandy Craig Formation (comprising mudstone and siltstone with thin beds of non-marine limestone and dolomite), overlain by superficial marine beach deposits of silt, sand and gravel. It is understood that the majority of Rosyth dockyard is reclaimed land, which may be contaminated. Modifications to existing facilities and the construction of new facilities within Rosyth dockyard could mobilise existing contaminants and create new pollution pathways for existing contaminants on the dockyard (e.g. piling and other intrusive construction techniques). However, any risk would be managed through a CEMP using BAT, which would ensure that any mobilisation of contaminants is controlled and therefore there would be minimal risk of significant effects during normal operations. The SDP may create opportunities to remediate existing areas of contaminated as part of construction, however this is uncertain. It is unknown whether SDP activities within Rosyth dockyard would affect land stability. This requires further investigation. However, taking account of the nature of SDP activities, which are similar to those currently being undertaken, it is considered that SDP activities are unlikely to significantly increase any risk of land instability. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any impacts on sea bed function and processes associated with channel modification and dredging. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards require comparable facilities for SDP activities, Devonport dockyard is less well equipped to undertake additional LLW processing. Further work would be required at Devonport dockyard to optimise the function of existing waste management facilities and the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 1D could therefore potentially have a greater impact on soil quality and contamination, although no significant impacts from construction are anticipated. There is the potential for significant adverse effects on sea bed function and processes and mobilisation of contaminants within the estuary by Devonport dockyard, if channel dredging is required to accommodate heavy lift operations (although it is expected that viable alternatives will be implemented ahead of heavy lift for the movement of submarines and fore and aft sections). As dredging to accommodate heavy lift operations is not required at to Rosyth dockyard, the potential for effects on soil and geology are considered likely to be less. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. In the case of the dual site option, transportation of submarines for dismantling could be avoided if the existing submarines remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. Although the need to undertake significant channel modification at Devonport dockyard would not be avoided, as there would still be a requirement for a heavy lift submersible ship/barge to transport the separated hull sections following RC removal. Overall, scale of potential effect of Option 1B could be greater than that of Options 1D and 1R as SDP facilities would need to be constructed at both dockyards, potentially resulting in greater levels of ground disturbance when compared to Options 1D and 1R, along with a requirement for significant dredging to be undertaken.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources.	-/?	-/?	-/?	**Potential Effects** No effects on geological conservation sites or important geological features are anticipated as a result of SDP activities within the dockyards, as the Devonport and Rosyth dockyards do not contain any areas of geological interest *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The Devonport and Rosyth dockyards are well established dockyards, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. Modifications to existing facilities and the development of new facilities at the Devonport and Rosyth dockyards is therefore unlikely to have a significant impact on soil resource and function, although there may be some localised disturbance from intrusive ground works such as piling (if required). There is a risk of new pollution pathways being created for any existing contaminants on the dockyards during construction, e.g. any intrusive ground works such as piling. There is also a risk of soil contamination from dust deposition, effluent discharge or through accidental spillage (including via air or water) during SDP activities, e.g. accidental release of pollutants during construction such as silty run-off or spilled fuel and oils; and accidental release of pollutants and radioactive material during initial dismantling (RPV removal) and segregation and size reduction (full dismantling of the RPV following interim storage) operations, including accidental release of untreated discharges *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations. SDP activities are not anticipated to affect land stability *(refer to impacts specific to the Devonport and Rosyth dockyards).* There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. It is expected that submarines will be wet towed into the dockyard. Of the technical options, taking account of interim storage requirements the scale of development required for the RPV option would be less than that of the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2 and, in consequence, the potential for any impact on soils during construction could be less. In addition, construction of the SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation and size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases may help to minimise any impacts on soils. However, it could also be argued that two periods of activity rather than one could be more disruptive due to the extended time period over which effects could occur. Although in the case of all of the technical options, as BAT principles would need to be adopted and the risk of accidental discharge is considered to be very low, no significant impacts on geology or soils are anticipated.
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	As the RPV option allows for the in-situ decay of short lived isotopes, following interim storage radioactivity levels would have reduced resulting in a reduction in potential sources of radiological discharge. In addition, following interim storage the RPV would not need to be placed back into the DBV prior to segregation, thus reducing the potential for accidental discharge into the basin (potentially affecting marine sediments) when compared to the RC option, which requires use of the DBV following initial dismantling. The delay from interim storage before size reduction begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. Devonport Dockyard There are no geological conservation sites or important geological features in Devonport dockyard. However, there are two geological sites located on the shoreline downstream of the dockyard: Mount Wise geological SSSI (a site within the Plymouth Limestone Group which comprises a discontinuous horizon rich in shelly remains of importance), which is located approx 2.5km to the south-east of Devonport dockyard; and Western King geological SSSI (a complex series of Devonian Limestones), located approx. 3.4km to the south-east of the dockyard. Both geological SSSI's were classified by Natural England as being in unfavourable but recovering condition. Taking account of the location of Devonport dockyard over 2km upstream of these geological SSSIs and the scale and nature of SDP activities to be undertaken, it is not anticipated that SDP activities would impact on the geological SSSIs. There may be the potential for adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel or oils into the water), although this is considered very unlikely. Devonport dockyard is underlain by alluvium above Upper Devonian Slate. The dockyard is primarily made of reclaimed ground. Fill material may have a high heavy metal content, often having been imported as ballast from mining areas further up the Tamar estuaries. Various contaminated land surveys were conducted during the construction phase of the recent modernisation and enhancement works. Localised contamination due to particular activities was detected, such as around the galvanising tanks of the old smithy. Lead, copper nickel and zinc levels were generally sufficiently high to require careful consideration of disposal routes. Modifications to existing facilities and the construction of new facilities within the Devonport dockyard could mobilise existing contaminants and create new pollution pathways for existing contaminants on the dockyard (e.g. piling and other intrusive construction techniques). However, any risk would be managed through a CEMP using BAT, which would ensure that any mobilisation of contaminants is controlled and therefore there would be minimal risk of significant effects during normal operations. The SDP may create opportunities to remediate existing areas of contaminated as part of construction, however this is uncertain. It is unknown whether SDP activities within Devonport dockyard would affect land stability. This requires further investigation. However, taking account of the nature of SDP activities, which are similar to those currently being undertaken, it is considered that SDP activities are unlikely to significantly increase any risk of land instability. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard.
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	Rosyth Dockyard There are no geological conservation sites or important geological features in Devonport dockyard. The nearest designated geological site is understood to be the Firth of Forth SSSI located approx. 0.3km to the west of Rosyth dockyard at its closest point. Taking account of the scale and nature of SDP activities to be undertaken, it is not anticipated that SDP activities would impact on the Firth of Forth geological SSSI. There may be the potential for adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel or oils into the water), although this is considered very unlikely. Rosyth dockyard is predominantly underlain by sedimentary rock of the Sandy Craig Formation (comprising mudstone and siltstone with thin beds of non-marine limestone and dolomite), overlain by superficial marine beach deposits of silt, sand and gravel. It is understood that the majority of Rosyth dockyard is reclaimed land, which may be

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				contaminated. Modifications to existing facilities and the construction of new facilities within Rosyth dockyard could mobilise existing contaminants and create new pollution pathways for existing contaminants on the dockyard (e.g. piling and other intrusive construction techniques). However, any risk would be managed through a CEMP using BAT, which would ensure that any mobilisation of contaminants is controlled and therefore there would be minimal risk of significant effects during normal operations. The SDP may create opportunities to remediate existing areas of contaminated as part of construction, however this is uncertain. It is unknown whether SDP activities within Rosyth dockyard would affect land stability. This requires further investigation. However, taking account of the nature of SDP activities, which are similar to those currently being undertaken, it is considered that SDP activities are unlikely to significantly increase any risk of land instability.
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any impacts on sea bed function and processes associated with channel modification and dredging. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards require comparable facilities for SDP activities, Devonport dockyard is less well equipped to undertake additional LLW processing. Further work would be required at Devonport dockyard to optimise the function of existing waste management facilities and the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Construction at Devonport dockyard could therefore potentially have a greater impact on soil quality and contamination, although no significant impacts from construction are anticipated. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. In the case of the dual site option, transportation of submarines for dismantling could be avoided if the existing submarines remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. Overall, the scale of potential effects of Option 2B could be greater than that of Options 2D and 2R as SDP facilities would need to be constructed at both dockyards, potentially resulting in greater levels of ground disturbance when compared to Options 2D and 2R, along with a requirement for significant dredging to be undertaken.

Options 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources.	-/?	-/?	-/?	**Potential Effects** No effects on geological conservation sites or important geological features are anticipated as a result of dismantling activities within the Devonport and Rosyth dockyards, as the dockyards do not contain any areas of geological interest *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The Devonport and Rosyth dockyards are well established dockyards, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. Modifications to existing facilities and the development of new facilities at the Devonport and Rosyth dockyards is therefore unlikely to have a significant impact on soil resource and function, although there may be some localised disturbance from intrusive ground works such as piling (if required). There is a risk of new pollution pathways being created for any existing contaminants on the dockyards during construction, e.g. any intrusive ground works such as piling *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There is also a risk of soil contamination from dust deposition, effluent discharge or through accidental spillage (including via air or water) during SDP activities, e.g. accidental release of pollutants during construction such as silty run-off or spilled fuel and oils; and accidental release of pollutants and radioactive material during initial dismantling (RPV removal) and segregation and size reduction (full dismantling of the RPV following interim storage) operations, including accidental release of untreated discharges. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations. Dismantling activities are not anticipated to affect land stability *(refer to impacts specific to the Devonport and Rosyth dockyards).* There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. It is expected that submarines will be wet towed into the dockyard. In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation/size reduction (full dismantling of the RPV following interim storage). Depending on the land use of the remote site, construction of interim storage and segregation/size reduction facilities (if required) could impact on geological conservation sites or important geological features, soil resource and contamination. At this stage a remote site has not been identified and subsequently any impact on geology and soils is uncertain, although assuming that the remote site is likely to predominantly comprise developed land, the potential for significant impacts is considered unlikely. Of the technical options, taking account of interim storage requirements the scale of development required for the RPV option would be less than that of the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2 and, in consequence, the potential for any impact on soils during construction could be less. In addition, construction would also take place on two different sites, reducing any impacts from SDP activities as the scale of activity undertaken at the respective sites would be less.
E. Geology and Soils Minimise threats to the extent and quality of soils and geological	-/?	-/?	-/?	Construction of the SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation and size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases may help to minimise any impacts on soils. However, it could also be argued that two periods of activity rather than one could be more disruptive due to the extended time period over which effects

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
resources. *(continued)*				could occur. Although in the case of all of the technical options, as BAT principles would need to be adopted and the risk of accidental discharge is considered to be very low, no significant impacts on geology or soils are anticipated. As the RPV option allows for the in-situ decay of short lived isotopes, following interim storage radioactivity levels would have reduced. In addition, following interim storage the RPV would not need to be placed back into the DBV prior to segregation, thus reducing the potential for accidental discharge into the basin when compared to the RC option, which requires use of the DBV following initial dismantling. The delay from interim storage before segregation/size reduction begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. <u>Devonport Dockyard</u> There are no geological conservation sites or important geological features in Devonport dockyard. However, there are two geological sites located on the shoreline downstream of the dockyard: Mount Wise geological SSSI (a site within the Plymouth Limestone Group which comprises a discontinuous horizon rich in shelly remains of importance), which is located approx 2.5km to the south-east of Devonport dockyard; and Western King geological SSSI (a complex series of Devonian Limestones), located approx. 3.4km to the south-east of the dockyard. Both geological SSSI's were classified by Natural England as being in unfavourable but recovering condition. Taking account of the location of Devonport dockyard over 2km upstream of these geological SSSIs and the scale and nature of SDP activities to be undertaken, it is not anticipated that SDP activities would impact on the geological SSSIs. There may be the potential for adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel or oils into the water), although this is considered very unlikely. Devonport dockyard is underlain by alluvium above Upper Devonian Slate. The dockyard is primarily made of reclaimed ground. Fill material may have a high heavy metal content, often having been imported as ballast from mining areas further up the Tamar estuaries. Various contaminated land surveys were conducted during the construction phase of the recent modernisation and enhancement works. Localised contamination due to particular activities was detected, such as around the galvanising tanks of the old smithy. Lead, copper nickel and zinc levels were generally sufficiently high to require careful consideration of disposal routes.
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	Modifications to existing facilities and the construction of new facilities within the Devonport dockyard could mobilise existing contaminants and create new pollution pathways for existing contaminants on the dockyard (e.g. piling and other intrusive construction techniques). However, any risk would be managed through a CEMP using BAT, which would ensure that any mobilisation of contaminants is controlled and therefore there would be minimal risk of significant effects during normal operations. The SDP may create opportunities to remediate existing areas of contaminated as part of construction, however this is uncertain. It is unknown whether dismantling activities within Devonport dockyard would affect land stability. This requires further investigation. However, taking account of the nature of dismantling activities, which are similar to those currently being undertaken, it is considered that dismantling activities are unlikely to significantly increase any risk of land instability. <u>Rosyth Dockyard</u> There are no geological conservation sites or important geological features in Devonport dockyard. The nearest designated geological site is understood to be the Firth of Forth SSSI located approx. 0.3km to the west of Rosyth dockyard at its closest point. Taking account of the scale and nature of dismantling activities to be undertaken, it is not anticipated that dismantling activities would impact on the Firth of Forth geological SSSI.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				There may be the potential for adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water), although this is considered very unlikely.
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	Rosyth dockyard is predominantly underlain by sedimentary rock of the Sandy Craig Formation (comprising mudstone and siltstone with thin beds of non-marine limestone and dolomite), overlain by superficial marine beach deposits of silt, sand and gravel. It is understood that the majority of Rosyth dockyard is reclaimed land, which may be contaminated. Modifications to existing facilities and the construction of new facilities within Rosyth dockyard could mobilise existing contaminants and create new pollution pathways for existing contaminants on the dockyard (e.g. piling and other intrusive construction techniques). However, any risk would be managed through a CEMP using BAT, which would ensure that any mobilisation of contaminants is controlled and therefore there would be minimal risk of significant effects during normal operations. The SDP may create opportunities to remediate existing areas of contaminated as part of construction, however this is uncertain. It is unknown whether dismantling activities within Rosyth dockyard would affect land stability. This requires further investigation. However, taking account of the nature of dismantling activities, which are similar to those currently being undertaken, it is considered that dismantling activities are unlikely to significantly increase any risk of land instability. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any impacts on sea bed function and processes associated with channel modification and dredging. **Comparison of the Options** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. In the unlikely event that heavy lift operations are necessary then dredging will be required at Devonport dockyard with the potential for significant adverse effects on sea bed function and processes and mobilisation of contaminants within the estuary by Devonport dockyard compared to Rosyth dockyard where no dredging will be required. However, as submarines are likely to be towed to Devonport dockyard for dismantling, dredging is unlikely to be required at either site. At this stage a remote site for interim storage and segregation/size reduction has not been identified and subsequently the potential effect of these activities on geology and soils is uncertain. The potential for effects would depend on the location of the remote site and its land use, the presence of contamination and and its proximity to geological sites. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each dockyard. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, in the case of the dual site option transportation of submarines for dismantling could be avoided if the existing submarines remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. It is noted that the scale of potential effects of Option 3/4B could be greater than that of Options 3/4D and 3/4R as dismantling facilities would need to be constructed at both dockyards, potentially resulting in greater levels of ground disturbance when compared to Options 3/4D and 3/4R, along with a potential requirement for significant dredging to be undertaken.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources.	-	-	-	**<u>Potential Effects</u>** No effects on geological conservation sites or important geological features are anticipated as a result of SDP activities within the dockyards, as the Devonport and Rosyth dockyards do not contain any areas of geological interest *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The Devonport and Rosyth dockyards are well established dockyards, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. Modifications to existing facilities and the development of new facilities at the Devonport and Rosyth dockyards is therefore unlikely to have a significant impact on soil resource and function, although there may be some localised disturbance from intrusive ground works such as piling (if required). There is a risk of new pollution pathways being created for any existing contaminants on the dockyards during construction, e.g. any intrusive ground works such as piling. There is also a risk of soil contamination from dust deposition, effluent discharge or through accidental spillage (including via air or water) during SDP activities, e.g. accidental release of pollutants during construction such as silty run-off or spilled fuel and oils; and accidental release of pollutants and radioactive material during initial dismantling (RPV removal) and segregation and size reduction (full dismantling of the RPV following interim storage) operations, including accidental release of untreated discharges *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations. SDP activities are not anticipated to affect land stability *(refer to impacts specific to the Devonport and Rosyth dockyards).* There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. It is expected that submarines will be wet towed into the dockyard. In the unlikely event that submarines are transported using a heavy left vessel, there is the potential for any dredging and channel modification to have an effect on sea bed function and processes, and mobilise existing contamination, due to the physical displacement of the estuary bed. There is the potential for sediment within estuary channels to be contaminated with a range of potential pollutants (e.g. heavy metals, organics including pesticides, PCBs and nutrients) from municipal, industrial and agricultural sources, although the current levels of contamination are unknown *(refer to impacts specific to the Devonport and Rosyth dockyards).*

Assessment Criteria	Score			Commentary
	5D	5R	5B	
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	Of the technical options, taking account of interim storage requirements the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with storage of PW expected to require1,005m^2. However, in the case of the PW option as it involves full early dismantling of the RPV and segregation/size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on soils from SDP activities when compared to the RC and RPV options. Although, as in the case of all of the technical options, no significant effects on soils are anticipated. <u>Devonport Dockyard</u> There are no geological conservation sites or important geological features in Devonport dockyard. However, there are two geological sites located on the shoreline downstream of the dockyard: Mount Wise geological SSSI (a site within the Plymouth Limestone Group which comprises a discontinuous horizon rich in shelly remains of importance), which is located approx 2.5km to the south-east of Devonport dockyard; and Western King geological SSSI (a complex series of Devonian Limestones), located approx. 3.4km to the south-east of the dockyard. Both geological SSSI's were classified by Natural England as being in unfavourable but recovering condition. Taking account of the location of Devonport dockyard over 2km upstream of these geological SSSIs and the scale and nature of SDP activities to be undertaken, it is not anticipated that SDP activities would impact on the geological SSSIs. There may be the potential for adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water), although this is considered very unlikely. Devonport dockyard is underlain by alluvium above Upper Devonian Slate. The dockyard is primarily made of reclaimed ground. Fill material may have a high heavy metal content, often having been imported as ballast from mining areas further up the Tamar estuaries. Various contaminated land surveys were conducted during the construction phase of the recent modernisation and enhancement works. Localised contamination due to particular activities was detected, such as around the galvanising tanks of the old smithy. Lead, copper nickel and zinc levels were generally sufficiently high to require careful consideration of disposal routes. Modifications to existing facilities and the construction of new facilities within the Devonport dockyard could mobilise existing contaminants and create new pollution pathways for existing contaminants on the dockyard (e.g. piling and other intrusive construction techniques). However, any risk would be managed through a CEMP using BAT, which would ensure that any mobilisation of contaminants is controlled and therefore there would be minimal risk of significant effects during normal operations. The SDP may create opportunities to remediate existing areas of contaminated as part of construction, however this is uncertain. It is unknown whether SDP activities within Devonport dockyard would affect land stability. This requires further investigation. However, taking account of the nature of SDP activities, which are similar to those currently being undertaken, it is considered that SDP activities are unlikely to significantly increase any risk of land instability.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. Rosyth Dockyard There are no geological conservation sites or important geological features in Devonport dockyard. The nearest designated geological site is understood to be the Firth of Forth SSSI located approx. 0.3km to the west of Rosyth dockyard at its closest point. Taking account of the scale and nature of SDP activities to be undertaken, it is not anticipated that SDP activities would impact on the Firth of Forth geological SSSI. There may be the potential for adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water), although this is considered very unlikely. Rosyth dockyard is predominantly underlain by sedimentary rock of the Sandy Craig Formation (comprising mudstone and siltstone with thin beds of non-marine limestone and dolomite), overlain by superficial marine beach deposits of silt, sand and gravel. It is understood that the majority of Rosyth dockyard is reclaimed land, which may be contaminated. Modifications to existing facilities and the construction of new facilities within Rosyth dockyard could mobilise existing contaminants and create new pollution pathways for existing contaminants on the dockyard (e.g. piling and other intrusive construction techniques). However, any risk would be managed through a CEMP using BAT, which would ensure that any mobilisation of contaminants is controlled and therefore there would be minimal risk of significant effects during normal operations. The SDP may create opportunities to remediate existing areas of contaminated as part of construction, however this is uncertain. It is unknown whether SDP activities within Rosyth dockyard would affect land stability. This requires further investigation. However, taking account of the nature of SDP activities, which are similar to those currently being undertaken, it is considered that SDP activities are unlikely to significantly increase any risk of land instability.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any impacts on sea bed function and processes associated with channel modification and dredging. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards require comparable facilities for SDP activities, Devonport dockyard is less well equipped to undertake additional LLW processing. Further work would be required at Devonport dockyard to optimise the function of existing waste management facilities and the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Construction at Devonport dockyard could therefore potentially have a greater impact on soil quality and contamination, although no significant impacts from construction are anticipated. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage.

Option 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources.	-/?	-/?	-/?	**Potential Effects** No effects on geological conservation sites or important geological features are anticipated as a result of SDP activities within the Devonport and Rosyth dockyards, as the dockyards do not contain any areas of geological interest *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The Devonport and Rosyth dockyards are well established dockyards, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. Modifications to existing facilities and the development of new facilities at the Devonport and Rosyth dockyards is therefore unlikely to have a significant impact on soil resource and function, although there may be some localised disturbance from intrusive ground works such as piling (if required). There is a risk of new pollution pathways being created for any existing contaminants on the dockyards during construction, e.g. any intrusive ground works such as piling *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There is also a risk of soil contamination from dust deposition, effluent discharge or through accidental spillage (including via air or water) during SDP activities, e.g. accidental release of pollutants during construction such as silty run-off or spilled fuel and oils; and accidental release of pollutants and radioactive material during initial dismantling (RPV removal) and segregation and size reduction (full dismantling of the RPV following interim storage) operations, including accidental release of untreated discharges. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations. Dismantling and segregation/size reduction activities are not anticipated to affect land stability *(refer to impacts specific to the Devonport and Rosyth dockyards).* There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. It is expected that submarines will be wet towed into the dockyard. In the unlikely event that submarines are transported using a heavy left vessel, there is the potential for any dredging and channel modification to have an effect on sea bed function and processes, and mobilise existing contamination, due to the physical displacement of the estuary bed. There is the potential for sediment within estuary channels to be contaminated with a range of potential pollutants (e.g. heavy metals, organics including pesticides, PCBs and nutrients) from municipal, industrial and agricultural sources, although the current levels of contamination are unknown *(refer to impacts specific to the Devonport and Rosyth dockyards).* In the case of this option, following segregation and size reduction of the RPV, the PW would be transported off the segregation/size reduction site to a remote site for interim storage. Depending on the land use of the remote site, construction of interim storage facilities (if required) could impact on geological conservation sites or important geological features, soil resource and contamination. At this stage a remote site has not been identified and subsequently any impact on geology and soils is uncertain, although assuming that the remote site is likely to predominantly comprise developed land, the potential for significant impacts is considered unlikely. Of the technical options, taking account of interim storage requirements the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with storage of PW expected to require1,005m^2. However, in the case of the PW option as it involves full early dismantling of the RPV and segregation/size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				impacts on soils from SDP activities when compared to the RC and RPV options. Notwithstanding this, construction would take place on two different sites, reducing any impacts from SDP activities as the scale of activity undertaken at the respective sites would be less. Although in the case of all of the technical options, no significant effects on soils are anticipated.
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	<u>Devonport Dockyard</u> There are no geological conservation sites or important geological features in Devonport dockyard. However, there are two geological sites located on the shoreline downstream of the dockyard: Mount Wise geological SSSI (a site within the Plymouth Limestone Group which comprises a discontinuous horizon rich in shelly remains of importance), which is located approx 2.5km to the south-east of Devonport dockyard; and Western King geological SSSI (a complex series of Devonian Limestones), located approx. 3.4km to the south-east of the dockyard. Both geological SSSI's were classified by Natural England as being in unfavourable but recovering condition. Taking account of the location of Devonport dockyard over 2km upstream of these geological SSSIs and the scale and nature of SDP activities to be undertaken, it is not anticipated that SDP activities would impact on the geological SSSIs. There may be the potential for adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water), although this is considered very unlikely. Devonport dockyard is underlain by alluvium above Upper Devonian Slate. The dockyard is primarily made of reclaimed ground. Fill material may have a high heavy metal content, often having been imported as ballast from mining areas further up the Tamar estuaries. Various contaminated land surveys were conducted during the construction phase of the recent modernisation and enhancement works. Localised contamination due to particular activities was detected, such as around the galvanising tanks of the old smithy. Lead, copper nickel and zinc levels were generally sufficiently high to require careful consideration of disposal routes. Modifications to existing facilities and the construction of new facilities within the Devonport dockyard could mobilise existing contaminants and create new pollution pathways for existing contaminants on the dockyard (e.g. piling and other intrusive construction techniques). However, any risk would be managed through a CEMP using BAT, which would ensure that any mobilisation of contaminants is controlled and therefore there would be minimal risk of significant effects during normal operations. The SDP may create opportunities to remediate existing areas of contaminated as part of construction, however this is uncertain. It is unknown whether SDP activities within Devonport dockyard would affect land stability. This requires further investigation. However, taking account of the nature of dismantling activities, which are similar to those currently being undertaken, it is considered that dismantling activities are unlikely to significantly increase any risk of land instability. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard.
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	<u>Rosyth Dockyard</u> There are no geological conservation sites or important geological features in Devonport dockyard. The nearest designated geological site is understood to be the Firth of Forth SSSI located approx. 0.3km to the west of Rosyth dockyard at its closest point. Taking account of the scale and nature of SDP activities to be undertaken, it is not anticipated that SDP activities would impact on the Firth of Forth geological SSSI. There may be the potential for adverse effects if a significant pollution incident occurred (e.g. release of significant levels of fuel, oils or radioactive material into the water), although this is considered very unlikely. Rosyth dockyard is predominantly underlain by sedimentary rock of the Sandy Craig

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				Formation (comprising mudstone and siltstone with thin beds of non-marine limestone and dolomite), overlain by superficial marine beach deposits of silt, sand and gravel. It is understood that the majority of Rosyth dockyard is reclaimed land, which may be contaminated. Modifications to existing facilities and the construction of new facilities within Rosyth dockyard could mobilise existing contaminants and create new pollution pathways for existing contaminants on the dockyard (e.g. piling and other intrusive construction techniques). However, any risk would be managed through a CEMP using BAT, which would ensure that any mobilisation of contaminants is controlled and therefore there would be minimal risk of significant effects during normal operations. The SDP may create opportunities to remediate existing areas of contaminated as part of construction, however this is uncertain. It is unknown whether SDP activities within Rosyth dockyard would affect land stability. This requires further investigation. However, taking account of the nature of SDP activities, which are similar to those currently being undertaken, it is considered that dismantling activities are unlikely to significantly increase any risk of land instability. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any impacts on sea bed function and processes associated with channel modification and dredging.
E. Geology and Soils Minimise threats to the extent and quality of soils and geological resources. *(continued)*	-/?	-/?	-/?	**Comparison of the Options** Assuming that the Devonport and Rosyth dockyards require comparable facilities for SDP activities, Devonport dockyard is less well equipped to undertake additional LLW processing. Further work would be required at Devonport dockyard to optimise the function of existing waste management facilities and the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Construction at Devonport dockyard could therefore potentially have a greater impact on soil quality and contamination, although no significant impacts from construction are anticipated. At this stage a remote site for interim storage has not been identified and subsequently the potential effect of these activities on geology and soils is uncertain. The potential for effects would depend on the location of the remote site and its land use, the presence of contamination and and its proximity to geological sites. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each dockyard. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects cannot be determined.

A6. Water Quality and Resources

6.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on water quality and resources. Information is presented for both national and sub-regional levels.

Water quality and resources within this context are defined as inland surface freshwater and groundwater resources, and inland surface freshwater, groundwater, estuarine, coastal and marine water quality.

There are links between the water quality and resources topic and a number of other SEA topics, in particular the effects and interactions of water quality and resources on biodiversity, population, human health and the impact of flood risk management and land use activities on water quality.

6.2 Summary of Plans and Programmes

6.2.1 International

The ***Water Framework Directive*** (WFD) is the most substantial piece of EC water legislation to date and replaces a number of existing Directives including the Surface Water Abstraction Directive. It establishes a framework for the protection of inland surface waters, transitional waters, coastal water and groundwater and is designed to improve and integrate the way water bodies are managed, including encouraging the sustainable use of water resources. The key objectives at European level are general protection of the aquatic ecology, specific protection of unique and valuable habitats, protection of drinking water resources, and protection of bathing water.

In accordance with Article 4(1), the Directive objectives for surface water, groundwater, transitional and coastal water bodies are to:

- prevent deterioration;

- reduce pollution;
- protect, enhance and restore condition;
- achieve ‘good status’ by 2015, or an alternative objective where allowed; and
- comply with requirements for protected areas .

The WFD requires that all polluters of the water environment should pay, and that implementation of the Directive is achieved in a fair and proportionate way across all sectors.

The aim of the ***Marine Strategy Framework Directive (2008)*** is to protect more effectively the marine environment across Europe. It aims to achieve good environmental status of the EU's marine waters by 2021 and to protect the resource base upon which marine-related economic and social activities depend.

With specific regard to coastal water quality, the ***Bathing Waters Directive (2006/7/EC)*** sets standards for the quality of bathing waters in terms of:

- the physical, chemical and microbiological parameters;
- the mandatory limit values and indicative values for such parameters; and
- the minimum sampling frequency and method of analysis or inspection of such water.

The OSPAR is the mechanism by which fifteen Governments of the western coasts and catchments of Europe, together with the European Community, cooperate to protect the marine environment of the North-East Atlantic. The OSPAR Radioactive Substances Strategy (2003) aims to prevent pollution of the maritime area covered by the OSPAR Convention (Convention for the Protection of the Marine Environment of the North-East Atlantic) from ionising radiation. In particular, the OSPAR objective for 2020 is to reduce discharges to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, are close to zero.

In addition, the following European Directives have relevance to the protection of the water environment and resources:

- Dangerous Substances Directive (76/464/EEC);
- Quality of Shellfish Waters Directive (79/923/EEC);
- Directive on Priority Substances (2008/105/EC);
- Groundwater Directive (80 /68/EEC);

- Urban Waste Water Treatment Directive (91/271/EEC);
- Drinking Water Directive (98/83/EC).

6.2.2 National

UK

The ***Flood and Water Management Act (2010)*** makes provisions about water, including those related to water resources, including;

- To widen the list of uses of water that water companies can control during periods of water shortage, and enable Government to add to and remove uses from the list.
- To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SUDS for new developments and redevelopments.
- To reduce 'bad debt' in the water industry by amending the Water Industry Act 1991 to provide a named customer and clarify who is responsible for paying the water bill.
- To make it easier for water and sewerage companies to develop and implement social tariffs where companies consider there is a good cause to do so, and in light of guidance that will be issued by the Secretary of State following a full public consultation.

The ***Marine and Coastal Access Act (2009)*** sets out a number of measures including the establishment of Marine Conservation Zones (MCZs) and Marine Spatial Plans. The main objectives of the ***Marine Policy Statement (2011)*** are to enable an appropriate and consistent approach to marine planning across UK waters, and to ensure the sustainable use of marine resources and strategic management of marine activities from renewable energy to nature conservation, fishing, recreation and tourism.

The ***draft National Policy Statement (2009)*** brings together national government policy for ports and sets out potential nationally significant infrastructure projects.

Defra's ***UK Strategy for Radioactive Discharges 2001-2020 (2002)*** delivers the UK's obligations under the OSPAR Radioactive Substances Strategy, in respect of progressive and substantial reductions in radioactive discharges.

The MOD's ***Sustainable Development Strategy (2008)*** and ***Sustainable Development Report and Action Plan (2008)*** aims to ensure all MOD sites become more water efficient to comply with Government and MOD targets.

England and Wales

In England and Wales, the implementation work related to the Water Framework Directive is undertaken by the Environment Agency, working in partnership with key stakeholders. For these reason the majority of data and programmes regarding Water Quality and Resources cover both administrations and therefore England and Wales are considered collectively in this chapter.

There are 11 River Basin Districts in England and Wales which each require (under the Water Framework Directive) a ***River Basin Management Plan (RBMP)*** including objectives for surface water, groundwater, transitional and coastal water bodies.

Water for people and the environment - Water resources strategy for England and Wales (2009) published by Environment Agency, includes the following objectives:

- enable habitats and species to adapt better to climate change;
- allow the way we protect the water environment to adjust flexibly to a changing climate;
- reduce pressure on the environment caused by water taken for human use;
- encourage options resilient to climate change to be chosen in the face of uncertainty;
- better protect vital water supply infrastructure;
- reduce greenhouse gas emissions from people using water, considering the whole life-cycle of use; and
- improve understanding of the risks and uncertainties of climate change.

Other relevant strategies include the Environment Agency's ***Catchment Abstraction Management Strategies*** (CAMS) which have identified a number of catchments in England and Wales which are designated as Over-Licensed or Over-Abstracted. That is, the current level of licensed abstraction could result in an unacceptable stress on the catchment's ecology (designated over-licensed) or possibly is resulting in an unacceptable effect (designated over-abstracted).

England

There are a number of strategies regarding water resources and quality which focus on either England or Wales, such as the Government's strategy for water in England, ***Future Water (2008)*** which sets out the Government's plans for the water sector by 2030 and the practical steps that will be taken to achieve them. It sets out a vision for the better management of surface water to address the dual pressures of climate change and population growth leading to housing development. Relevant objectives include that by 2030:

- to improve the quality of our water environment and the ecology which it supports, and continued to provide high levels of drinking water quality from our taps; and
- to ensure a sustainable use of water resources, and implemented fair, affordable and cost reflective water charges.

Wales

Within the ***Environment Strategy for Wales (2006),*** published by WAG there are a number of water related objectives; including:

- to manage water resources sustainably without causing environmental damage;
- to increase water efficiency and maintain water quality;
- to maintain and enhance quality of water sources; understand and manage diffuse pollution sources; and
- to minimise the risk posed by exposure to chemicals.

Planning Policy Wales (2010) (Edition 3) sets out the land use planning policies of the Welsh Assembly Government. Regarding water resources, PPW seeks to protect and improve water resources through increased efficiency and demand management of water, particularly in those areas where additional water resources may not be available and ensure that appropriate sewerage facilities are provided to convey, treat and dispose of waste water in accordance with appropriate legislation and sustainability principles.

Scotland

The ***Water Environment and Water Services (Scotland) Act 2003*** makes provisions for the protection of the Scottish water environment, including a timetable for implementation of requirements of the Water Framework Directive up until 2015.

The ***Water Environment (Controlled Activities) (Scotland) Regulations (2005)*** sets out the process by which activities that have the potential to affect Scotland's water environment are regulated. Authorisation under the Controlled Activities Regulations (CAR) is required for discharging to waters, disposal of pollutants to land, abstractions, impoundments and engineering works affecting water bodies.

The Scottish Environment Protection Agency's ***River Basin Planning Strategy for the Scotland River Basin District (2005)*** describes planned actions within three key areas necessary for the development of effective river basin planning, namely: establishing administrative arrangements and working principles to support RBMP production; delivering opportunities for participation and consultation, and integrating and coordinating the RBMP with other plans and planning.

Other relevant strategies include the Scottish Executives ***Bathing Water Strategy for Scotland (2006)*** which sets out a framework for meeting the challenges associated with implementing the revised Bathing Water Directive. This revision requires stricter bacteriological standards to be met in the future and sets new requirements for the provision of information on water quality to the public, as well as for engaging public participation in matters relating to bathing waters.

The Scottish Executive Scottish Coastal Forum's ***A Strategy for Scotland's Coast and Inshore Waters (2004)*** which has goals that include: delivering integrated management for the whole Scottish coast; establishing an integrated system of spatial planning for Scotland's inshore marine area which combines with the terrestrial planning system; strategic and adequately resourced leadership for the management and sustainable use of coastal resources; safeguard the resources of Scotland's coast and inshore waters and to promote awareness; to achieve effective stakeholder participation at the appropriate geographical and administrative levels amongst others.

Policies aimed to provide a sustainable future for Scotland's groundwater resources by protecting legitimate uses of groundwater are included within the ***Groundwater Protection Policy for Scotland (2009).***

Northern Ireland

Northern Irelands Water Environment (Water Framework Directive) Regulation 2003, transpose the Water Framework Directive into regulation in Northern Ireland. The objective of the regulations is to achieve a minimum standard of 'good' under the classification for water bodies.Similarly, ***Quality of Bathing Water Regulations (Northern Ireland) 1993,*** transpose the Bathing Water Directive into regulation in Northern Ireland.

6.2.3 Sub-regional locations

Plymouth

Plymouth's water resource management policies are set out in Plymouth City Councils ***Core Strategy - Policy CS22 (Pollution)*** which seeks to protect people and the environment from unsafe, unhealthy and polluted environments through Ensuring development causes no unacceptable impact on water or air quality and - ***Core Strategy - Policy CS20 (Sustainable Resource Use)*** which states that council will actively promote development which utilises natural resources in as an efficient and sustainable a way as possible. This will include: meeting high water efficiency standards, and incorporating new technologies to recycle and conserve water resources, and promoting the use of Sustainable Urban Drainage Schemes.

Following the requirements of the Water Framework Directive the Environment Agency have published the ***South West River Basin Management Plan*** which includes objectives for surface water, groundwater, transitional and coastal water bodies and covers Plymouth within its coverage area.

South West Water Resources Plan 2010-2035 sets out South West Water's strategy for ensuring all customers have a secure supply of water through to 2035 having regard to economics and the potential impact on the environment. This will be achieved by:

- keeping leakage at or below the economic level;
- water efficiency initiatives; and
- the introduction of tariffs.

The plan presents an appraisal of supply/demand projections for each Strategic Supply Area (Wimblebal, Colliford and Roadford) and proposes three major water supply initiatives for the South West Region to ensure a sustainable supply. Measures introduced for the Roadford Strategic Supply Area (which includes Plymouth, large parts of Devon and part of Cornwall) comprise company wide measures aimed at increasing water efficiency and implementing water saving measures.

Fife

The Fife Structure Plan ***Policy SS1: Settlement Development Strategy*** sets out that the Council will have regard to the anticipated demand for water and drainage and the need for Sustainable Urban Drainage Systems (SUDS) to address surface water run-off and to contribute to sustainable development and nature conservation and enhancement.

6.3 Overview of the Baseline

6.3.1 National

UK

The UK has a diversity of inland and coastal waters (such as reservoirs, lakes, rivers, canals, estuaries, transitional waters, and coastal waters). Protected water features include waters designated for human consumption (including those abstracted from groundwater); areas designated for the protection of economically significant aquatic species (e.g. shellfish or freshwater fish); bathing waters (under the Bathing Waters Directive); nutrient-sensitive areas; and areas with waters important to protected habitats or species under the Habitats Directive or the Birds Directive.

There are 182 protected areas in UK inshore waters with a marine element, which includes 81 Special Protection Areas (SPAs) with marine habitats for birds, 98 Special Areas of Conservation (SACs) with marine habitats or species and three Marine Nature Reserves. In total the area coverage of these sites exceeds 1.8 million hectares, or 2.2% of UK waters.[254]

The principal aquifers of the UK are located in the lowlands of England. The most important are the Chalk, Permo-Triassic sandstones, the Jurassic limestones and the Lower Greensand. Around 81% of groundwater bodies in England are at risk of failing Water Framework Directive objectives because of diffuse pollution.

As the majority of data regarding water resources and quality is collected by the Environment Agency (covering both England and Wales), Scottish Environment Protection Agency and Northern Ireland's Department of Ireland, there is little available data on a UK level and therefore for this chapter the remainder of the baseline is considered by these divisions of administrations.

England and Wales

Coastal water quality has improved over the last two decades, however current WFD draft classification results and maps produced by the Environment Agency indicate that there are still a large proportion of coastal waters in England (and Wales) that are classified as being of Moderate Ecological Status (see Figure 6.1) i.e. are failing to meet 'Good Ecological Status' (GES) on the basis of a number of physio-chemical and biological standards and are therefore in need of measures to achieve GES.

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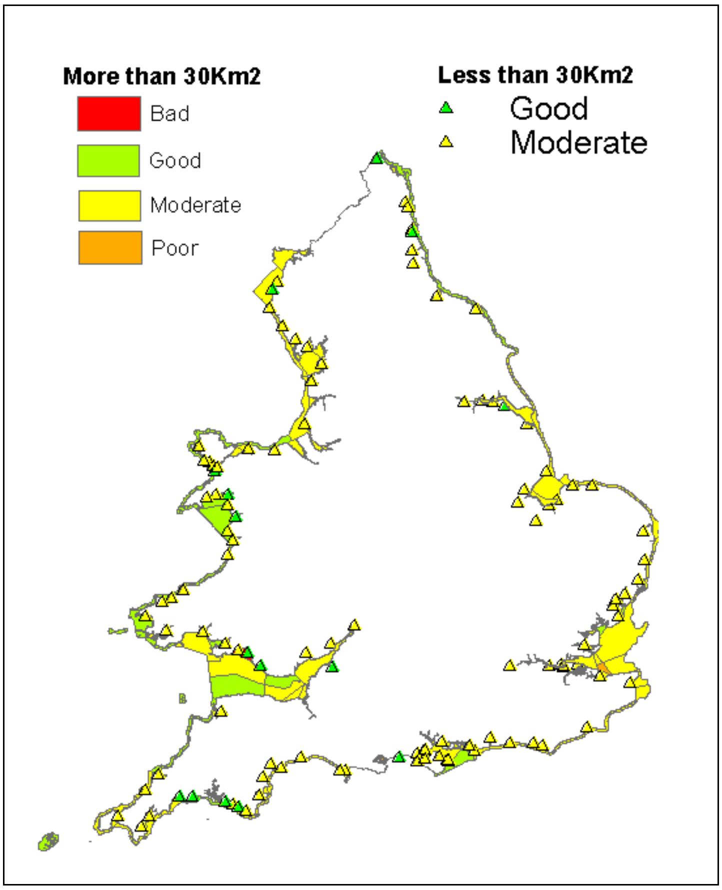
[254] http://www.defra.gov.uk/foodfarm/fisheries/documents/mpp2009-10info.pdf

Figure 6.1 **Ecological status/potential of estuaries and coasts in England and Wales**



Source: *Framework Directive results and maps* available at http://www.environment-agency.gov.uk/research/library/data/97343.aspx (accessed 21/10/2009)

England

River water quality in England has been steadily increasing since 1990 and in 2007, 72% of rivers were of good biological quality. Between 2006 and 2007, the percentage of rivers of 'good' chemical quality rose from 74% to 76% (based on the General Quality Assessment system[255] which is based on 3 determinands – dissolved oxygen, biochemical oxygen demand and ammoniacal nitrogen). High levels of phosphorus can result in increased algal growth in freshwater and high levels of nitrate are of concern in relation to drinking water abstractions. Rivers with the highest concentrations of phosphate and nitrate are mainly in central and eastern England reflecting geology, agricultural inputs and higher population

[255] The GQA system is being superseded by the Water Framework Directive regime, however the transition is on-going.

density.

Wales

The percentage of river lengths in Wales of good chemical quality has been consistently above 90% since 1994, and has remained at around 95% for the last three monitored years (2006-08). The percentage of river length in Wales of good biological quality has steadily increased since 2000, peaking at 88% in 2008.[256] In 2009, of the 82 EC-identified bathing waters monitored by Environment Agency Wales, 100% complied with the mandatory standards, up from 98.8% in 2008. EC identified beaches' performance against guideline standards also improved between 2008 and 2009, from 75.6% to 89.0% for UK Guideline standards.[257]

Scotland

Scotland has two river basin districts: the Scotland river basin district which covers most of Scotland and the Solway Tweed river basin district in the south of the country. In 2008, 65% of the Scotland river basin district surface water bodies and 76% of ground water bodies were classified (under the Water Framework Directive) as being of good or better condition.

In 2008 45% of the surface water bodies and 82% of ground water bodies in the Solway Tweed river basin district were classified as good condition or better.258 In 2009, 94% of Scotland's bathing waters achieved the EU mandatory standard and more than half of Scotland's bathing waters managed to achieve the more stringent guideline standard. This is a 3% increase in the number of beaches achieving mandatory compliance compared to 2008.[259]

Northern Ireland

In 2009, 58% of river waterbodies in Northern Ireland (monitored under the Water Framework Directive) are of at least a good chemical standard (Class B and above) and 41% are of at least good biological standard. Groundwater is currently of a high quality, with less than 2% of monitoring sites having an annual mean concentration of more than 40mg NO3/ l. In 2009 only two beaches (out of 24 monitored) in Northern Ireland failed to meet the mandatory standards, as stated by EC Bathing Water Directive, however less than half satisfied the guideline standards.[260]

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[256] Sustainable Development Indicators for Wales (2010) http://wales.gov.uk/topics/statistics/publications/sustain2010/?lang=en
[257] Environment Agency http://www.environment-agency.gov.uk/static/documents/Research/2009_BATHING_WATERS_REPORT_WALES.pdf
[258] SEPA http://www.sepa.org.uk/water/river_basin_planning.aspx
[259] SEPA http://www.sepa.org.uk/water/water_publications/bathing_water.aspx
[260] DOENI http://www.doeni.gov.uk/northern_ireland_environmental_statistics_report_2010-2.pdf

6.3.2 Sub-regional locations

Plymouth

The major surface water features within the Plymouth area are: Plymouth Sound (one of the world's great natural harbours); river Tamar; the Tory Brook; Tamerton Foliot stream; and the lower stretch of the River Plym. There are no major aquifers in the southwest. Some minor aquifers are important for local supplies, as is the case in Plymouth. There are 12 licensed private groundwater abstractions within the Plymouth boundaries, four of these are for private drinking supplies. [261]

In 2006 surveys record the following inland freshwater quality: 65.2% were in good biological condition; 34.8% were in fair biological condition (none in poor or bad condition) and 100% were in good chemical condition.[262]

Plymouth Sound waters are assessed as having good ecological quality, but poor chemical quality.[263] There are two bathing waters in Plymouth (Hoe West and Hoe East). In 2008 both these waters were rated as 'poor' for bathing water quality (down from Excellent since 2004).[264]

Plymouth has two protected water features, namely the Plymouth Sound and Estuaries SAC; and Tamar Estuaries Complex SPA.[265]

In 2007, radioactive discharge licences to the estuary were issued to Devonport Royal Dockyard Ltd.[266]

In 2004, a study for Natural England reported that the radiological significance of levels of radionuclides discharged into the Plymouth Sound and Estuaries SAC was considered to be low.[267]

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[261] Plymouth City Council, http://www.plymouth.gov.uk/characteristicsplymouth

[262] Defra, Inland Water Quality Surveys http://www.defra.gov.uk/evidence/statistics/environment/inlwater/iwquality.htm

[263] http://maps.environment-agency.gov.uk/wiyby/wiybyController?latest=true&topic=wfd_estuaries&ep=query&lang=_e&x=243933.66666666666&y=54230.083333333336&scale=4&layerGroups=3&queryWindowWidth=25&queryWindowHeight=25

[264] Environment Agency 2009 http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=245500.0&y=55500.0&scale=3&layerGroups=default&location=Devonport,%20City%20of%20Plymouth&ep=map&lang=_e&textonly=off&topic=coastalwaters#x=247881&y=53844&lg=1,&scale=5

[265] Plymouth City Council, Characteristics of the City of Plymouth http://www.plymouth.gov.uk/homepage/environmentandplanning/natureconservation/protectingnature/designatedconservationareas.htm

[266] Environment Agency (2009) Industrial Pollution maps, http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=247500.0&y=56500.0&topic=pollution&ep=map&scale=3&location=Plymouth,%20City%20of%20Plymouth&lang=_e&layerGroups=default&textonly=off#x=247500&y=56500&lg=5,4,1,&scale=4

[267] English Nature 2004 The South Western Peninsula Marine Natural Area http://naturalengland.etraderstores.com/NaturalEnglandShop/Product.aspx?ProductID=d92d70ba-37e6-489d-b069-845bd1bb5e13

Fife

Major surface water features within the Fife area are the River Ore, the River Eden and the River Leven. Major ground water features within the Fife area are, major aquifers including the Knox Pulpit Formation and other associated Devonian aquifers.[268]

Water quality in Fife is relatively good. In 2007, the 80% of bathing waters in Fife meet quality standards. In 2006 609km of rivers were sampled for quality. 62% were rated excellent; 42% were rated as good; 26% were rated fair; and 0% were rated seriously polluted.[269]

In 2008 the Lower Forth Estuary in Rosyth was classified by SEPA as having an overall status of Good with High confidence with overall ecological status of Good and overall ecological status of Pass.[270] Pressures on this water body include abstraction for the production of non-renewable electricity and point source pollution from sewage disposal, however measures, such as changing time/frequency of discharge, have been agreed to mitigate these effects.[270]

The protected water features within the Fife area are; Isle of May SAC; Firth of Tay and Eden Estuary SAC; Firth of Tay and Eden Estuary SPA; Firth of Forth SPA; Cameron Reservoir SPA; Forth Islands SPA; South Tayside Goose Roosts SPA; and Loch Leven SPA.[269]

In 2007, radioactive discharge licences to water were issued to Rosyth Royal Dockyard Ltd.[271]

6.4 Existing problems

6.4.1 National

In some urban areas in England there is relatively little water available per rata, and abstraction is above its sustainable level. The Environment Agency have derived assessments on availability of water resources for new abstraction based on Catchment Abstraction Management Strategy (CAMS) assessments and large areas of England, most notably in the South East, have been identified as areas where water for new abstractions will be limited to winter months when flows are high.[272]

This issue is likely to continue in the future based on projections on the future rainfall and demand has lead to the classification of all south-eastern areas as seriously water stressed. The remainder of the

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[268] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1
[269] Fife Council, Know Fife, http://knowfife.fife.gov.uk
[270] SEPA, Water Body Information Sheet http://apps.sepa.org.uk/rbmp/pdf/200435.pdf
[271] SEPA, Scottish Pollutant Release Inventory, http://apps.sepa.org.uk/SPRIPA/Search/ByLocalAuthority/Criteria.aspx
[272] http://sd.defra.gov.uk/2010/07/measuring-progress-sustainable-development-indicators-2010/

UK is classified as either having low or moderate water stress.

Recently published River Basin Management Plans (which have been established in accordance with the Water Framework Directive) have designated a number of freshwater (surface and groundwater), transitional (estuaries) and coastal water bodies in England as failing to meet “Good Ecological Status” (GES) on the basis of a number of physio-chemical and biological standards. Flows in rivers and freshwater inputs to transitional waters are considered to be a ‘supporting element’ in the achievement of GES.

In Southern and Eastern regions of England, where rainfall is comparatively low, per capita water consumption tends to be higher than elsewhere. In some areas, abstraction is above its sustainable level and this combined with projections for rainfall and demand has lead to the classification of all south-eastern areas as seriously water stressed.

Overall Scotland’s water environment is in a good condition but a wide range of problems exist at local levels. Approximately 40% of Scottish water bodies are at risk of failing to meet environmental standards set by the Water Framework Directive. Transitional waters are most at risk followed by lochs, ground-waters and rivers. The quality of coastal waters is high and improving further.[273]

The significant water issues in the Scotland river basin district have been identified as diffuse source pollution; point source pollution; abstraction and flow regulation; changes to morphology; and invasive alien species.[274]

Wales and Northern Ireland also have similar issues in some areas concerning water use, stress and diffuse source pollution as the rest of the UK.

6.4.2 Sub-regional locations

Plymouth

Challenges affecting water quality in the South West River Basin District include diffuse pollution from agricultural activities; diffuse and point source pollution from disused mines; point source pollution from water industry sewage works; and physical modification of water bodies. Plymouth has a long maritime history with naval and defence industries continuing to be important to the local economy. Historic mining and industrial activity has significantly affected land, water quality and estuary sediments over many years.[275]

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[273] http://www.seaguidance.org.uk/Upload/Documents/L3EX2CurrentstateandtrendsforWATERSCOT.PDF
[274] http://www.sepa.org.uk/water/river_basin_planning.aspx
[275] South West River Basin District River Basin Management Plan,

Fife

General problems affecting the water environment include; point source pollution, diffuse pollution, changes to water bodies resulting from engineering works, and building on flood plains.[276]

6.5 Likely evolution of the baseline

6.5.1 National

UK

The current trend in water condition is generally towards increased water quality across natural environments, drinking water and bathing waters[277]. Current climate change predictions indicate that rainfall patterns will become increasingly seasonal, with lower amounts of flow in the summer. This will lead to lower summer river flows, especially in those catchments with a low groundwater component. This could lead to increased abstraction pressure, increased stress on sensitive hydrological systems and a decrease in dilution potential leading to a failure against water quality targets. Increased flooding and storm events also have the potential to increase runoff of pollutants into controlled waters, thus reducing water quality. Population pressures are predicted to increase in certain parts of Great Britain, for example in the south east. Increased population density will result in an increased pressure on natural resources and could exacerbate current problems or cause new ones.

The Marine and Coastal Access Act (2009) allows for the creation of Marine Conservation Zones (MCZs) in Great Britain (Northern Ireland MCZs will be introduced through separate legislation). MCZs will protect nationally important marine wildlife, habitats, geology and geomorphology. Sites will be selected to protect the range of marine wildlife[278]. This should lead to greater protection and improvement of marine habitats in the future.

Under the revised Bathing Water Directive all bathing waters will be required to achieve at least 'sufficient' quality by 2015, which is twice as stringent as the current mandatory standard. The overall quality of bathing waters is therefore likely to increase as water quality is improved to meet the increased standards.[279]

The main sources of radioactivity in water are discharges from the nuclear sector and hospitals and the

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http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/southwest/Intro.aspx

[276] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1

[277] Defra, Sustainable Development Indicators, 2009, http://www.defra.gov.uk/sustainable/government/progress/documents/SDIYP2009_a9.pdf

[278] Natural England. http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/mcz/default.aspx

[279] Environment Agency http://www.environment-agency.gov.uk/research/library/data/112170.aspx

offshore oil and gas industry which discharges naturally occurring radionuclides. 'Charting Progress 2' indicates that received doses of radioactivity to both humans and wildlife continue to be well within regulatory limits.[280]

In March 2009 MOD water use had already reduced by almost 25% against the 2004/05 baseline, due to leakage reduction, against a Government target of 25% by 2020.[281] Other targets within the ***Sustainable Development Strategy (2008)*** and ***Sustainable Development Report and Action Plan (2008*** include;

- by December 2020 reduce water use (from consumption and leakage) by 6 million cubic metres from 2005/06 (MOD commitment);

- ongoing target to ensure that all new builds and major refurbishments are designed in line with water efficiency best practice through adherence to BREEAM/DREAM standards; and

- by 2012 conduct water audits across our whole estate and implement recommendations

The UK strategy for radioactive discharges projected reduction in radioactivitiy from liquid discharges for 2001 to 2020 from the defence sector[282] as follows:

- tritium levels are projected to fall from around 700 GBq/yr in 2001-2005 to around 400 GBq/yr by 2016-2020;

- total Beta levels are projected to fall from around 5 GBq/yr in 2001-2005 to around 3 GBq/yr by 2016-2020; and

- total Alpha levels are projected to fall from around 0.1 GBq/yr in 2001-2025 to around 0 GBq/yr by 2016-2020.

England and Wales

The Environment Agency's Catchment Abstraction Management Strategies (CAMS) have identified a number of catchments in England and Wales which are designated as Over-Licensed or Over-Abstracted. Climate change is likely to result in lower summer rainfalls and more frequent/sever winter flood events. Such changes are likely to increase pressure on summer freshwater water availability and

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[280] http://chartingprogress.defra.gov.uk/assessment-summary-cleansafe (accessed 16/03/2011)
[281] MOD, Sustainable Development Report and Action Plan, 2008, http://www.mod.uk/NR/rdonlyres/D8407A1C-CA68-4AD4-8E17-9F71B151AF6A/0/SusDevReport2008.pdf
[282] Defra http://www.defra.gov.uk/environment/radioactivity/government/discharges/pdf/rad_dischargestrat2.pdf

increase pollutant runoff into controlled waters during flood events. Unsustainable groundwater and surface water abstraction may contribute to environmental damage of rivers and wetlands at 500 sites in England and Wales, important conservation sites, including sites of national and international conservation importance.

The Environment Agency aims that by 2030 water use per person in England should fall by 130 litres/day.[283]

The Water Framework Directive (Directive 2000/60/EEC) requires that river basin management plans are prepared by December 2009. The objectives of the river basin management plans are required to be achieved by 2015.[283] Those objectives are to:

- prevent deterioration, enhance and restore bodies of surface water, achieve good chemical and ecological status of such water and reduce pollution from discharges and emissions of hazardous substances;
- protect, enhance and restore all bodies of groundwater, prevent the pollution and deterioration of groundwater, and ensure a balance between groundwater abstraction and replenishment; and
- preserve protected areas.

Defra aims that by 2030 at the latest, England has improved the quality of our water environment and the ecology which it supports, and continued to provide high levels of drinking water quality from its taps; sustainably manage risks from flooding and coastal erosion, with greater understanding and more effective management of surface water; ensure a sustainable use of water resources, and implement fair, affordable and cost reflective water charges; cut greenhouse gas emissions; and embed continuous adaptation to climate change and other pressures across the water industry and water users.[284]

Environment Agency aims to enhance water supply by up to 1100 Ml/d above present levels by the improvement of existing schemes and the development of some new resources. [285]

There is a trend of improving quality of rivers within England; between 1990 and 2008 the percentage of rivers of good biological quality in England rose from 63 to 72 per cent. Over the same time period the percentage of rivers of good chemical quality rose from 55 to 79 per cent.[286]

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[283] EU http://europa.eu/legislation_summaries/agriculture/environment/l28002b_en.htm
[284] Future Water, the Government's Water Strategy for England
[285] EA, Water Resources for the Future: A Strategy for England and Wales
[286] Defra, Sustainable Development Indicators (2010) http://sd.defra.gov.uk/2010/07/measuring-progress-sustainable-development-indicators-

In 2008, 88 per cent of rivers in Wales were of good biological quality. In all years since 1993 over 90 per cent of rivers in Wales have been of good chemical quality.[287]

Scotland

In Scotland, the percentage of rivers of good quality has remained stable at around 88 per cent between 2000 and 2006, based on a combined chemical, biological and aesthetic assessment.[288] In most cases the risks to water quality are declining, the exception being groundwater. Local circumstances create local trends, e.g. upland lochs are particularly sensitive to environmental changes. The most important trends are the sources of effects. Environmental effects from industry are declining, whereas effects from urban development and intensification are increasing.[289]

The Scotland river basin district objective is to improve water quality such that 98% of surface water bodies and 94% of ground water bodies will be of good or better condition by 2027.[290] By 2027 the objective for the Solway Tweed river basin district is for 92% of surface water bodies and 93% of groundwater bodies to be of good or better quality.[291]

Northern Ireland

In 2006, 54 per cent of rivers in Northern Ireland were of good biological quality, and 74 per cent of rivers were of good chemical quality.[292]

There has been some reduction in chemical pollution of Northern Ireland rivers in recent years and the quality of the bathing waters around NI coasts is improving. The biological quality of Northern Ireland rivers has deteriorated in recent years and levels of nutrients are relatively high in lakes and some rivers.[293]

6.5.2 Sub-regional locations

Plymouth

Plymouth has a trend of increasing water consumption.[294] Bathing waters around Plymouth are generally

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2010/
[287] Defra, Sustainable Development Indicators, 2009, http://www.defra.gov.uk/sustainable/government/progress/documents/SDIYP2009_a9.pdf
[288] Defra, Sustainable Development Indicators, 2009, http://www.defra.gov.uk/sustainable/government/progress/documents/SDIYP2009_a9.pdf
[289] SNIFFER http://www.seaguidance.org.uk/Upload/Documents/L3EX2CurrentstateandtrendsforWATERSCOT.PDF
[290] Scottish Government (2009) The river basin management plan for the Scotland river basin district 2009–2015
[291] Scottish Government and Environment Agency (2009) The river basin management plan for the Solway Tweed river basin district 2009–2015
[292] Defra, Sustainable Development Indicators, 2009, http://www.defra.gov.uk/sustainable/government/progress/documents/SDIYP2009_a9.pdf
[293] SNIFFER http://www.seaguidance.org.uk/Upload/Documents/L3EX2CurrentstateandtrendsforWATERNI.PDF
[294] Plymouth City Council
http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm

increasing in water quality (from poor quality in 1988 to excellent quality in 2006).[294] However, in 2008 both bathing waters were rated as 'poor' for water quality (down from Excellent since 2004). River waters around Plymouth are generally increasing in quality.[295]

The South West Region water quality is improving. However locally there are some areas with no net change in poor water quality. The trend is therefore of ongoing point source and diffuse pollution and disruption of naturally purifying and hydrating hydrological cycles as a result of increasing development and agricultural intensification. However, Plymouth CC aims to ensure development causes no unacceptable impact on water or air quality.[296]

The South West Region water demand is forecast to increase by 20% due to population growth. Local water shortages are expected in places due to over abstraction, summer drought, disruption of naturally hydrating hydrological cycles increasing with development and agricultural intensification.[297] There have been three pollution incidents since 2005, two of which were significant and one of which was severe. [298] The South West Region aims to manage demand and supply of water to ensure no net increase in demand with population growth by 2020.[299]

By 2015, 24 per cent of surface waters in this catchment will improve for at least one element of good status. Six river water bodies will improve to good ecological status by 2015, including the Tamerton Foliot Stream, where the fish population will improve. One lake will improve to good ecological status, Lower Tamar Lake. As a result of these improvements, 39 per cent of water bodies will achieve good ecological status by 2015.

The population in the river basin district will continue to increase, with further urbanisation. Agriculture will respond to the changing climate both here and abroad, market conditions, financial incentives and regulatory pressures. Technology and other solutions to address the pressures will improve, but the rate at which some new solutions can be introduced will depend on the economic climate.[300]

By 2015, 22 per cent of surface waters in the South West River Basin District will show an improvement by 2015 for one or more of the elements measured. This translates to nearly 2,800 kilometres of river or canal improved.[300]

By 2015, 42 per cent of surface waters will be in at least good ecological status/potential and 65 per cent of assessed surface waters will be at least good biological status. 57 per cent of groundwater bodies will

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[295] Environment Agency 2010 http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm
[296] Plymouth CC, Plymouth City Council - Core Strategy - Policy CS22
[297] South West Regional Environment Network's Environmental Priorities 2010, http://www.swenvo.org.uk/swren/work/
[298] Environment Agency (2009) Current maps, http://maps.environment-agency.gov.uk
[299] South West Regional Environment Network's Environmental Priorities 2009, http://www.swenvo.org.uk/swren/work/
[300] http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/southwest/Intro.aspx

be at good or better status overall by 2015.[300]

Fife

Between 1950 and 1970 there was 57% reduction in ponds in Fife. However between 1990 and 1998 there was no significant change in pond numbers.[301]

There is a general trend of increasing freshwater quality due to reduced agricultural and point source pollution of freshwater as a result of river basin management plans.[302]

Targets identified within the sub region in relation to water quality are:

- limit water pollution to levels that do not damage natural systems;
- maintain water abstraction, run-off and recharge within carrying capacity (including future capacity) maintain and restore key ecological processes (e.g. hydrology, water quality, coastal processes);
- protect and, where necessary, enhance water-body status; and reduce/manage flood risk.[303]

6.6 Assessment objective, guide questions and significance

The objective and guide questions related to water quality and resources that have been used in the assessment of the effects of the SDP are set out in Table 6.1, together with reasons for their selection.

Table 6.1 Approach to assessing the effects of SDP on water quality and resources

Objective/guide question	Reasoning
Objective: Maximise water efficiency, protect and enhance water quality.	The SEA Directive requires that likely significant effects on water be taken into account in the Environmental Report.

[301] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1
[302] Fife Council, Fife Structure Plan SEA 2008, http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/dev-plan/FifeSP/FifeSEAreport
[303] Fife Council, Fife Structure Plan 2006 - 2026 Post Adoption SEA 2010, http://www.fifedirect.org.uk/uploadfiles/publications/c64_PostAdoption-FinalisedPostAdoptionSEAStatement-January20101.pdf

Objective/guide question	Reasoning
Will the SDP proposals affect demand for water resources?	The Water Framework Directive encourages the sustainable use of water resources. Government strategies including the Future Water (2008) for England, and the Environment Strategy for Wales (2006) promote the sustainable use of water. Some parts of the country have abstraction above a sustainable level which could result in water shortages in some areas in the future.
Will the SDP proposals affect the amount of waste water and surface runoff produced?	Surface runoff and waste water may affect water quality if it reaches water receptors. Water Framework Directive requires all inland, coastal and groundwater to reach a 'good' chemical and ecological status by 2015. Under Water Environment Regulations (Controlled Activities) (Scotland) (2005) authorisation is required for discharges to water.
Will the SDP proposals cause any changes in radioactive or other hazardous discharges to water?	The OSPAR Radioactive Substances Strategy (2003) and UK Strategy for Radioactive Discharges 2001-2020 include the objective to reduce discharges to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, are close to zero, by 2020.
Will the SDP proposals affect the quality of groundwater, surface waters or sea water?	Water Framework Directive requires all inland, coastal and groundwater to reach a 'good' chemical and ecological status by 2015. Government strategies, such as Future Water (2008) and Environment Strategy for Wales (2006) include objectives to protect quality of water.
Will the SDP proposals affect the distribution and quality of freshwater or marine sediments?	Water Framework Directive requires all inland, coastal and groundwater to reach a 'good' chemical and ecological status by 2015, including freshwater. Affecting marine sediments may negatively affect the quality of marine environment. The Marine Strategy Framework Directive (2008) aims to achieve good environmental status of the EU's marine water by 2021.

Table 6.2 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the water quality and resources objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 6.2 Approach to determining the significance of effects on water quality and resources

Effect	Description	Illustrative Guidance
++	Significant positive	• Option would lead to a major reduction in water use compared to prior to development such that the risk of water shortages in the area is significantly decreased and abstraction is at least at a sustainable level in the long term. • Option would significantly decrease the amount of waste water, surface runoff and pollutant discharges so that the quality of that water receptors (including groundwater, surface water, sea water or drinking receptors) will be significantly improved and sustained and that all water targets (including those relevant to chemical and ecological condition) are reached and exceeded.
+	Positive	• Option would lead to a minor reduction in water use compared to prior to development such that the risk of water shortages in the area is decreased in the short term and abstraction is closer to sustainable levels than prior to development. • Option would lead to minor decreases in the amount of waste water, surface runoff and/or pollutant discharges so that the quality of water receptors (including groundwater, surface water, sea water or drinking receptors) may be improved to some level temporarily and that some water targets (including those relevant to chemical and ecological condition) will be reached/exceeded.
0	No (neutral effects)	• Option would not significantly affect water demand and abstraction levels will not be altered. • Option would not change amount of waste water, surface runoff and/or pollutant discharges so that the quality of water receptors will not be affected.
-	Negative	• Option would lead to a minor increase in water use compared to prior to development such that the risk of water shortages in the area is increased to some level in the short term and abstraction is further removed from sustainable levels. • Option would lead to minor increases in the amount of waste water, surface runoff and/or pollutant discharges so that the quality of water receptors (including groundwater, surface water, sea water or drinking receptors) may be decreased to some level temporarily and it may prevent some water targets (including those relevant to chemical and ecological condition) from being achieved.
--	Significant negative	• Option would lead to major increases in water use compared to prior to development such that the risk of water shortages in the area is significantly increased and abstraction is beyond sustainable levels. • Option would lead to an exceedence of an abstraction license limit. • Option would lead to major increases in the amount of waste water, surface runoff and/or pollutant discharges so that the quality of water receptors (including groundwater, surface water, sea water or drinking receptors) will be considerably increased and will prevent some or all water targets (including those relevant to chemical and ecological condition) from being achieved.
?	Uncertain	• From the level of information available the impact that the option would have on this objective is uncertain.

6.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the water quality and resources objective. **Table 6.3** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 6.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 6.4** below.

Table 6.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than

Category	Assumption Description
	‘greenfield’ sites, although it is recognised that ‘brownfield’ land can be important for conservation and biodiversity. • **‘Existing’, nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the ‘Dock Bottom Village’), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m^2. Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2 . As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, ‘greenfield’ site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an ‘existing’ site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct (‘wet’) tow, or a ‘dry’ tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average).

Category	Assumption Description
	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine • It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since recycling a cleared submarine is little different to recycling a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be

Category	Assumption Description
	transported from the initial dismantling facility to the interim storage facility by sea, rail or road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Table 6.3** are considered in-turn below.

Stage I: Design and Develop Initial Submarine Dismantling Facilities

Water Quality and Resources

Option 1: Develop a Greenfield Site for Initial Submarine Dismantling

Assessment of Effects:

Water would be required throughout the construction phase for use in construction activities (e.g. for cement mixing, cleaning machinery and dust suppression). During construction, water would also be required for potable purposes such as drinking water, as well as toilet and washing facilities. Potential sources of supply include the use of mains supply water or surface or groundwater abstraction.

Depending on local water resource availability and demand at the site, there would be the potential for water use to affect the availability of water for other licensed water abstractors within the water resource zone. The potential effects on water resources would be assessed in the determination of any new abstraction licenses by the Environment Agency (EA) or equivalent regulator.

Construction activities would generate several sources of water requiring discharge, including surface run-off, groundwater from dewatering, any effluent arising from water use on site and foul water. Discharge from the site could affect the water quality and/or rate of flows of receiving waters.

Surface run-off could contain contaminants released through spillage of materials used during construction such as chemicals and fuels.

Option 1 will require the greatest extent of dredging for the longest duration, as it is assumed that necessary infrastructure (such as a dock) will not be present. Consequently, the impacts on the quality of aquatic and estuarine environments could be significant.

Surface construction activities, particularly site clearance and levelling, the introduction of hardstanding, and the construction of surface bunds from the excavated topsoil may increase flood risk during the construction phase, due to changes to surface drainage patterns and the increase in impermeable surface areas, affecting run-off rates and flow pathways. Unless mitigated, the changes in flows and the infrequent increased sediment deposition associated with flooding may affect aquatic environments.

It is generally expected that the scale of construction on a greenfield site will be greater than for the other options as it is assumed that all/most of the supporting infrastructure and ancillary facilities will be required. As a result, there will be a greater use of water during construction than for the other options and the potential significance of such effects will be greatest.

The potential effects on water resources and the quality of any receiving waters will depend on the nature, quality and significance of both. However, it is assumed for the purposes of the assessment that existing water quality and quality of aquatic environment will be high in the environs of a coastal greenfield site.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). As a result the total volumes of water used/discharged, extent of dredging and effects on water resources, quality, flood risk and aquatic environments is likely to remain the same across the technical options. However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage resulting in construction, volumes of water used and discharged to be spread out over two time periods compared to the Packaged Waste option where all construction will occur prior to interim storage. However, this is unlikely to alter the significance of effects as abstraction will be within limits posed by the abstraction license by EA and discharges are expected to be within acceptable levels.

Proposed Mitigation / Enhancements Measures:

- Where possible, surface facilities and infrastructure should be located to minimise any effect on hydrology as far as possible.
- Potential sources of water resources for use during works should be identified at an early stage and abstraction from the source should result the lowest environmental effect possible.
- Design for surface water drainage should incorporate sustainable techniques (SUDS) where possible which incorporate surface storage and attenuation, and infiltration to ground if near surface hydrogeology is suitable. Run-off from rainfall should be limited to greenfield rates

Stage I: Design and Develop Initial Submarine Dismantling Facilities Water Quality and Resources	
agreed with the EA or equivalent body prior to design. In line with the requirements of Planning Policy Statement (PPS) 25 and other equivalent policies, SUDS should be used to attenuate any increases in surface run-off rates. • Measures to reduce the risk of pollution incidents and accidental discharge and to control the rates of water discharged from the site should be outlined within a CEMP. These should follow best practice pollution prevention guidelines produced by the EA or equivalent bodies. Measures could include the use of impermeable membranes, bunded and tanked fuel storage, double lined settlement lagoons and interceptors. All discharges off-site would be agreed with the EA or equivalent body. Discharges to surface water or groundwater would require EA consent. • Settlement lagoons should be adequately protected through the use of double linings to prevent loss and appropriately sited to mitigate the risks of contaminating groundwater or surface water bodies in the case of flooding. • The handling of any hazardous materials or fluids must be carried out in accordance with relevant best practice guidance and make use of bunds and suitable storage tanks effectively providing sealed areas with adequate storage and collection facilities. • A Spillage Response Plan should be developed and implemented, which sets out systems to ensure that pollution effects are contained and minimised and that clean-up procedures and spill kits are in place to respond effectively once an incident is discovered. Training should be provided to all staff working on the site on the spill response procedures and periodic auditing of the procedures should take place. Sufficient spill kits should be provided and maintained and the contents should be subject to periodic checks. • Avoid development in locations of high water stress, including areas that are dry, have poor drainage or high water demand. • Implementation of water efficiency and re-use measures on site (demand management techniques, grey water recycling and rain water harvesting) should be implemented where appropriate, to minimise demand for water resources and consequential environmental effects. • Where wastewater is not to be discharged to sewer it should be treated on site to acceptable standards before being discharged to local watercourses. On site treatment could include reedbeds and other sustainable treatment processes where appropriate, thereby adding biodiversity value to the site.	
Summary: Option 1 has been assessed as having a significant negative effect in relation to this objective, due to the negative impact that extensive construction activities, including dredging, are likely to have on water quality and aquatic environments. Development on greenfield land is also expected to require greater volumes of water use which could have negative impacts on water resource, depending upon the existing levels of water stress. For RC and RPV options construction of the size reduction facility would be delayed however, this is unlikely to alter the significance of effects on this objective as discharges and volumes of water abstracted will be within acceptable levels set by EA or equivalent regulator.	--
Option 2: Develop a Brownfield Site for Initial Submarine Dismantling	
Assessment of Effects: As for Option 1, water will be required throughout the construction phase for both construction activities and potable purposes. The potential sources of supply will remain the same (including the use of mains supply water or surface or groundwater abstraction). However, given that the majority of ancillary infrastructure will be in place, the overall scale of construction will be less than for Option 1 and consequently the demand for water will be reduced. This will decrease the potential of adversely affecting the availability of water for other licensed water abstractors within the water resource zone, although this will also depend on local water resource availability. However, the scale of construction under this option is such that the existing water resources may still be impacted. Furthermore, it may be expected that as a brownfield site is more likely to be in a developed area the existing demand for water/levels of water stress may be greater. The potential effects on water resources would be assessed in the determination of any new abstraction licenses by the Environment Agency (EA) or equivalent regulator. Although the sources of supply are likely to stay the same as for greenfield sites, the overall volumes of water discharged from construction activities and potential surface run off are likely to be less, which will decrease the risk of negatively affecting water quality or flows of rate of receiving waters. Depending on the nature of the site selected, there is potential for construction activities to result in the mobilisation of previously entrapped	

Stage I: Design and Develop Initial Submarine Dismantling Facilities Water Quality and Resources	
contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water. Under Option 2, the level of dredging will be less (as fewer waterside facilities will be needed to be constructed) and therefore, the impact on the quality of aquatic and estuarine environments will be less than Option 1. The impact of dredging is still considered to be negative, and depending on the existing quality of the aquatic environment could be potentially significant. For brownfield sites the majority of hardstanding should already be in place and there should be reduced/minimal surface construction activities compared to Option 1. As a result changes to surface drainage patterns or flow pathways and consequently flood risk should be less and unlikely to cause a significant effect. The potential effects on the quality of any receiving waters will depend on the nature, quality and significance of existing water quality. It may be possible that the existing water quality and quality of aquatic environment will be worse for a brownfield site than greenfield as it is expected to be in a more developed area. However, it is also possible that the brownfield site could be surrounded by a pristine environment or within close proximity to sensitive areas meaning that surrounding water and aquatic environment could be of a similar quality to greenfield areas. Therefore, the impact is considered to be negative with the potential to be significant depending on the proximity of sensitive sites. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). As a result the total volumes of water used/discharged, extent of dredging and effects on water resources, quality, flood risk and aquatic environments is likely to remain the same across the technical options. However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage resulting in construction, volumes of water used and discharged to be spread out over two time periods compared to the Packaged Waste option where all construction will occur prior to interim storage. However, this is unlikely to alter the significance of effects as abstraction will be within limits posed by the abstraction license by EA and discharges are expected to be within acceptable levels. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a negative effect in relation to this objective. This is due to the negative impact that construction activities, including dredging, are likely to have on water quality and aquatic environments. Whilst the risk of accidental discharge to water during construction is low, there is the possibility of land contamination becoming mobilised and entering the water environment as a consequence of construction activities. The volumes of water necessary for construction will be considerably lower than for Option 1; however, still may have an effect on existing water resources depending upon the existing levels of water stress. For RC and RPV options construction of the size reduction facility would be delayed however, this is unlikely to alter the significance of effects on this objective as discharges and volumes of water abstracted will be within acceptable levels set by EA or equivalent regulator.	-
Option 3: Develop an Existing Licensed/Authorised Site for Initial Submarine Dismantling	
Assessment of Effects: The range of required construction activities that require water, such as cement mixing, cleaning machinery and dust suppression, for Option 3 are considered to be similar to that of Option 2. Sufficient infrastructure should be in place to accommodate SDP facilities such that the overall scale of these activities and demand for water will be less under Option 3 than Option 2. However, the scale of construction is such that the existing water resources, including availability of water for other licensed water abstractors within the water resource zone, may still be impacted. The potential effects on water resources would be assessed in the determination of any new abstraction licenses by the Environment	

Stage I: Design and Develop Initial Submarine Dismantling Facilities **Water Quality and Resources**	
Agency (EA) or equivalent regulator. Although the sources of are likely to stay the same as for brownfield sites, the overall volumes of water discharged from construction activities and potential surface run off are likely to be less, which will decrease the risk of negatively affecting water quality or flows of rate of receiving waters. Likewise to brownfield sites, there is potential for construction activities to result in the mobilisation of previously entrapped contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water. It is assumed that dredging will be required for the construction of waterside facilities. Although this is expected to be to a lesser degree than Options 1 or 2 (as most of the waterside facilities will already be present), the impact is still considered to be negative, and depending on the existing quality of the aquatic environment could be potentially significant. Surface drainage patterns or flow pathways and consequently flood risk should not be affected as all the hardstanding should already be in place at a Licensed/Authorised site. The potential effects on the quality of any receiving waters will depend on the nature, quality and significance of existing water quality. There is potential for the Licensed/Authorised site to be in close proximity to sensitive aquatic environments. Therefore, the impact is considered to be negative with the potential to be significant depending on the proximity of sensitive sites. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). As a result the total volumes of water used/discharged, extent of dredging and effects on water resources, quality, flood risk and aquatic environments is likely to remain the same across the technical options. However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage resulting in construction, volumes of water used and discharged to be spread out over two time periods compared to the Packaged Waste option where all construction will occur prior to interim storage. However, this is unlikely to alter the significance of effects as abstraction will be within limits posed by the abstraction license by EA and discharges are expected to be within acceptable levels. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective. This is due to the negative impact that construction activities, including any dredging, are likely to have on water quality and aquatic environments. Whilst the risk of accidental discharge to water during construction is low, there is the possibility of land contamination becoming mobilised and entering the water environment as a consequence of construction activities. The volumes of water necessary for construction will be considerably lower than for Option 1; however, still may have an effect on existing water resources depending upon the existing levels of water stress. For RC and RPV options construction of the size reduction facility would be delayed however, this is unlikely to alter the significance of effects on this objective as discharges and volumes of water abstracted will be within acceptable levels set by EA or equivalent regulator.	**-**

Stage II: Design and Develop the Interim ILW Storage Facilities

Water Quality and Resources

Option 1: Develop a Greenfield Site for ILW Storage

Assessment of Effects:

Given the generic nature of the construction proposals for the interim storage facility, it is assumed that the potential effects associated with this objective will be largely similar as for Stage 1.

Water would be required throughout the construction phase for use in construction activities (e.g. for cement mixing, cleaning machinery and dust suppression). During construction, water would also be required for potable purposes such as drinking water, as well as toilet and washing facilities. Potential sources of supply include the use of mains supply water or surface or groundwater abstraction.

Depending on local water resource availability and demand at the site, there could be the potential for water use to affect the availability of water for other licensed water abstractors within the water resource zone.

Construction activities would generate several sources of water requiring discharge, including surface run-off, groundwater from dewatering, any effluent arising from water use on site and foul water. Surface run-off could contain contaminants released through spillage of materials used during construction such as chemicals and fuels. Discharge from the site could affect the water quality and/or rate of flows of receiving waters.

Surface construction activities may increase flood risk during the construction phase, due to changes to surface drainage patterns and the increase in impermeable surface areas, affecting run-off rates and flow pathways.

It is generally expected that the scale of construction on a greenfield site will be greater than for the other options as it is assumed that all/most of the infrastructure and ancillary facilities as well as the storage facility itself will be required. Dock construction and dredging (if required) could impact on the quality of the aquatic and estuarine environments, will be greater than for other options, and has the potential to be significant.

The potential effects on water resources and the quality of any receiving waters will depend on the nature, quality and significance of both.

Technical Options:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

Given that the scale of construction for the RC option is greater than for RPV/Packaged Waste options, it is expected that greater volumes of water will be required for construction and potable needs over a longer time period increasing the potential to negatively affect water availability compared to the other technical options. Increasing construction activities will lead to greater volumes of discharge increasing the potential to negatively affect water quality or water flow rates in receiving waters.

The greater footprint of a RC storage facility is also likely to increase impermeable surfaces and alter surface drainage patterns to a greater level than the other technical options, increasing the potential of negatively affecting flood risk.

Due to the need to transport RC by sea, RC storage facilities would require the construction of a dock. The dredging activities associated with the construction of the necessary dock could impact on the quality of the aquatic and estuarine environments. Similar effects may also be generated under the RPV option should RPVs be transported by sea.

Proposed Mitigation / Enhancements Measures:

- Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities on a greenfield site).

Summary:

Option 1 has been assessed as having a negative effect in relation to this objective due to the scale of construction activities and the assumption that the water quality and quality of aquatic environment will be high in the environs of a coastal greenfield

Stage II: Design and Develop the Interim ILW Storage Facilities Water Quality and Resources	
site. Water demand associated with the construction of the interim storage facility could also have negative impacts on water resource, depending upon the existing levels of water stress. These effects may be significant should the development comprise a RC storage facility given the increased scale of construction and volumes of water used/discharged relative to RPV and Packaged Waste options. Dredging to construct a dock and channel of sufficient depth to accept delivery of RCs (and, potentially, RPVs) for storage at the facility could also have a significant negative impact on water quality and the quality of the aquatic/estuarine environment.	**-/--**

Option 2: Develop a Brownfield Site for ILW Storage

Assessment of Effects:

The range of construction activities that require water, such as cement mixing, cleaning machinery and dust suppression, for development on a brownfield site are considered to be similar to that on a greenfield site and therefore the same potential effects as identified for Option 1 apply. However, it is generally expected that the scale of construction on a brownfield site will be less than for Option 1 as it is assumed that most of the infrastructure and ancillary facilities will already be present. As a result, there will be a decreased volume of water used/discharged compared to the other options and the risk of potentially affecting water resources as mentioned above will be less.

Under Option 2, it is assumed that the level of dredging (if required) will also be less (as fewer waterside facilities will be needed to be constructed) and therefore, the impact on the quality of aquatic and estuarine environments will be less than Option 1. The impact of dredging is still considered to be negative, and depending on the existing quality of the aquatic environment could be potentially significant.

For brownfield sites, it is assumed that there will be some hardstanding and/or impermeable surfaces will exist, and surface drainage patterns will already have been modified to some extent. It is considered the additional effects of construction on surface drainage and consequently flood risk should be less than for Option 1 and would be unlikely to cause a significant effect.

Depending on the nature of the site selected, there is potential for construction activities to result in the mobilisation of previously entrapped contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water.

The potential effects on the quality of any receiving waters will depend on the nature, quality and significance of existing water quality. There is potential that the existing water quality and quality of aquatic environment will be poorer for a brownfield site than greenfield as it is expected to be in a more developed area. However, it is also possible that the brownfield site could be surrounded by a pristine environment or within close proximity to sensitive areas meaning that surrounding water and aquatic environment could be of a similar quality to greenfield areas. Therefore, the impact is considered to be negative with the potential to be significant depending on the proximity of sensitive sites.

Technical Options:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

Given that the scale of construction for the RC option is greater than for RPV/Packaged Waste options, it is expected that greater volumes of water will be required for construction and potable needs over a longer time period increasing the potential to negatively affect water availability compared to the other technical options. Increasing construction activities will lead to greater volumes of discharge increasing the potential to negatively affect water quality or water flow rates in receiving waters.

The greater footprint of a RC storage facility is also likely to increase impermeable surfaces and alter surface drainage patterns to a greater level than the other technical options, increasing the potential of negatively affecting flood risk.

Stage II: Design and Develop the Interim ILW Storage Facilities Water Quality and Resources	
Due to the need to transport RC by sea, RC storage facilities may require dredging of the estuary to ensure the maintenance of an accessible channel to the existing docking facilities, which has the potential to negatively affect aquatic and estuarine environments. Similar effects may also be generated under the RPV option should RPVs be transported by sea. **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of a dismantling facility).	
Summary: Option 2 has been assessed as having a negative effect in relation to this objective. This is due to the negative impact that construction activities are likely to have on water quality and aquatic environments. Whilst the risk of accidental discharge to water during construction is low, there is the possibility of land contamination becoming mobilised and entering the water environment as a consequence of construction activities. The volumes of water necessary for construction will be considerably lower than for Option 1; however, still may have an effect on existing water resources depending upon the existing levels of water stress. The severity of these effects may be increased should the development comprise a RC storage facility given the increased scale of construction and volumes of water used/discharged relative to RPV and Packaged Waste storage options. Some dredging to ensure docks are of sufficient depth to accept delivery of RCs (and, potentially RPVs) for storage at the facility may also be required which could have a negative impact on water quality and the quality of the aquatic/estuarine environment.	-
Option 3: Develop an Existing Licensed/Authorised Site for ILW Storage	
Assessment of Effects: The range of required construction activities for a storage facility on a Licensed/Authorised site will be similar as for the other options and therefore the same potential effects as identified for Options 1 and 2 apply. However, sufficient infrastructure should be in place to accommodate an interim storage facility such that the overall scale of these activities and associated effects will be less under Option 3 than Option 2. Given that necessary infrastructure, such as docks required for RC storage, should already be in place, it is considered that the extent of dredging required will be minimal (if required at all). Surface drainage patterns or flow pathways and consequently flood risk should not be affected as it is assumed that the site will contain extensive hardstanding and impermeable surfaces. If parts of the site are prone to temporary flooding, the construction activities provide the potential to address the underlying causes of flooding through the construction of new drainage systems (including SUDS). Depending on the nature of the site selected, there is potential for construction activities to result in the mobilisation of previously entrapped contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water. The potential effects on the quality of any receiving waters will depend on the nature, quality and significance of existing water quality. There is potential for the Licensed/Authorised site to be in close proximity to sensitive aquatic environments. Therefore, the impact is considered to be negative with the potential to be significant depending on the proximity of sensitive sites. **Technical Options:** The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows: • RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas). • RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.	

Stage II: Design and Develop the Interim ILW Storage Facilities Water Quality and Resources	
• Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure. As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar. However, as the docks are expected to already be in use at Licensed/Authorised sites it is anticipated that the level of dredging required under RC and RPV options and potential negative effects may be less than for brownfield sites. **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of a dismantling facility).	
Summary: Option 3 has been assessed as having either a neutral or potentially minor negative effect in relation to this objective. This is due to the potential effect that construction activities could have on water quality and aquatic environments due to use and discharges. Whilst the risk of accidental discharge to water during construction is low, there is the possibility of land contaminates becoming mobilised and entering the water environment as a consequence of construction activities. The volumes of water necessary for construction will be lower than for Options 1 and 2; however, still may have an effect on existing water resources depending upon the existing levels of water stress. The severity of these effects may be increased should the development comprise a RC storage facility given the increased scale of construction and increased volumes of water used/discharged relative to RPV and Packaged Waste options.	**0/-**

Stage III: Dock Submarines and Remove the Radioactive Materials

Water Quality and Resources

Option 1: Reactor Compartment Separation

Assessment of Effects:

During submarine movement to the initial dismantling facility there is a risk of accidental discharge of non-radioactive contaminants, including oils and fuels, which could have a negative effect on water quality and marine environments. However, it is considered that any such risk is remote as submarines will have undergone preparation for safe transportation. If an incident occurred such as a collision, grounding or a major fire, there is potential for direct and indirect discharges to water. If these events were to occur, the resulting pollution could have a negative effect on the water environment; however, the likelihood of any such event occurring is considered to be very small. The risk of such an event occurring will be influenced by the total distance travelled and choice of transport method (one of three options; wet tow, dry tow or standard cargo vessel).

Processing and dismantling of the RC, including activities such as jet washing, cutting, dust separation and damping down, will use considerable volumes of freshwater. Water will also be required for potable purposes such as drinking water, as well as toilet and washing facilities.

Depending on the local water resource availability and demand at the site, there could be the potential for water use to affect the availability of water for other licensed water abstractors within the water resource zone. The potential effects on water resources would be assessed in the determination of abstraction licenses by Environment Agency (EA) or equivalent regulator.

Operational activities would generate several sources of water requiring discharge, including surface run-off, any effluent arising from water use on site and foul water. Discharge from the site could affect the water quality and/or rate of flows of receiving waters. Any potential effects on water quality (and its indirect effects on marine biota) would be considered as part of any determination of a permit by the EA (or equivalent regulator).

All three technical options (RC, RPV and Packaged Waste) involve common life cycle activities and although there will be minor differences depending on the exact techniques employed, it is assumed that the radioactive and non-radioactive discharges to water from operations will be minimal across all options and will remain well below statutory levels (being subject to stringent environmental permitting requirements with Best Available Techniques (BAT) principles adopted). There is the potential for impacts, e.g. accidental release of pollutants and radioactive material during initial dismantling including accidental release of untreated discharges or uncontrolled flooding or dewatering in the Dock Bottom Village (DBV), which could have a negative impact on water quality and marine environments. The magnitude of such effect would depend on the quality of water in receiving areas and proximity to sensitive sites (such as drinking water receptors, protected areas including SPAs and SACs). The risk of a credible unplanned release of radioactivity into the environment will intuitively increase in proportion to the extent of dismantling, although strict legal controls are in place to prevent such events from occurring. As RC separation is the least intrusive of the technical options and allows for further natural radioactive decay prior to size reduction, the already very low risk of any accidental discharge or hazardous materials would be the lowest of the three technical options.

Proposed Mitigation / Enhancements Measures:

- Conduct routine monitoring of surface water discharges to check with consented pH, BOD, and chemical levels etc.
- Measures to reduce the risk of pollution incidents and accidental discharge and to control the rates of water discharged from the site should be outlined within an EMS. These should follow best practice pollution prevention guidelines produced by the EA or equivalent bodies. All discharges off-site would be agreed with the EA or equivalent body. Discharges to surface water or groundwater would require EA consent.
- The handling of any hazardous materials or fluids must be carried out in accordance with relevant best practice guidance and make use of bunds and suitable storage tanks effectively providing sealed areas with adequate storage and collection facilities.
- A Spillage Response Plan should be developed and implemented, which sets out systems to ensure that pollution effects are contained and minimised and that clean-up procedures and spill kits are in place to respond effectively once an incident is discovered. Training should be provided to all staff working on the site on the spill response procedures and periodic auditing of the procedures should take place. Sufficient spill kits should be provided and maintained and the contents should be subject to periodic checks.
- Where wastewater is not to be discharged to sewer it should be treated on site to acceptable standards before being discharged to local watercourses. On site treatment could include reedbeds and other sustainable treatment processes where appropriate, thereby adding biodiversity value to the site.

<table>
<tr><td colspan="2">Stage III: Dock Submarines and Remove the Radioactive Materials
Water Quality and Resources</td></tr>
<tr><td>Summary:
Option 1 has been assessed as having a potentially negative effect in relation to this objective. Water will be required for a variety of the RC separation activities, such as jet washing, damping and cutting, and its use could have negative impacts on water resource, depending upon the existing levels of water stress and quality of water in receiving areas.
Operational activities will also generate several sources of water requiring discharge, including surface run-off, any effluent arising from water use on site and foul water. Discharge from the site could affect the water quality and/or rate of flows of receiving waters.
Although the likelihood of accidental discharges during processing and movement of submarines are considered to be remote, in such an event there could be a potentially significant negative effect on water quality and marine environments, depending upon the quality of water in receiving waters and proximity to sensitive water receptors (such as drinking water receptors or protected areas including SPA and SACs).</td><td>-</td></tr>
<tr><td colspan="2">Option 2: Reactor Pressure Vessel Removal</td></tr>
<tr><td colspan="2">Assessment of Effects:
The potential effects are similar to the range of effects described in Option 1. Although Option 2 will require an increase in processing activities in the medium term related to the removal of the RPV, it is assumed that the majority of cutting and processing activities will be within the interior of the submarine and amount of ‘heavy’ cutting of the hull of the submarine, which is expected to require the greatest volumes of water, will be less than for Option 1. Therefore, it is expected that less water will be required and consequently the potential for water use to negatively affect water availability for other licensed water abstractors will be less than for Option 1.
The RPV option is requires more intrusive activities in the RC to remove the RPV from the submarine hull. However, operational activities will be closely regulated and subject to stringent Health and Safety, Best Available Techniques (BAT) and Environmental Permitting requirements to ensure any discharges are consistent with best practice and minimal. However, if the safeguards were to fail there could be potentially a significant negative impact on water quality and marine environments, the magnitude of such effect would depend on the quality of water in receiving areas and proximity to sensitive sites (such as drinking water receptors, protected areas including SPAs and SACs).
Proposed Mitigation / Enhancements Measures:
• No additional mitigation measures proposed above those set out for Option 1</td></tr>
<tr><td>Summary:
Option 2 has been assessed as having a potentially negative effect in relation to this objective. The volume of water required for and discharged as a result of processing activities, such as jet washing, damping and cutting, could have negative impacts on water resource, depending upon the existing levels of water stress and quality of water in receiving areas.
Although the likelihood of accidental discharges during processing and movement of submarines are considered to be remote, in such an event there could be a potentially significant negative effect on water quality and marine environments, depending upon the quality of water in receiving waters and proximity to sensitive water receptors (such as drinking water receptors or protected areas including SPA and SACs).</td><td>-</td></tr>
<tr><td colspan="2">Option 3: Reactor Pressure Vessel Removal and Size Reduction for Storage as Packaged Waste</td></tr>
<tr><td colspan="2">Assessment of Effects:
The potential effects are similar to the range of effects described in Option 1. Under this option, the RPV will be removed from the hull and processed to packaged waste. This will require a greater number of processing activities than Option 2, some of which are likely to use water. Therefore, it is expected that the volumes of water required for Option 3 and consequently the potential for water use to negatively affect water</td></tr>
</table>

Stage III: Dock Submarines and Remove the Radioactive Materials Water Quality and Resources	
availability for other licensed water abstractors will be more than for Option 2. It is uncertain whether the additional water will be greater than that for the increased heavy cutting of the hull required for the RC option, although it is likely to be of a similar scale. Operational activities would generate several sources of water requiring discharge, including surface run-off, any effluent arising from water use on site and foul water. Discharge from the site could affect the water quality and/or rate of flows of receiving waters. Any potential effects on water quality (and its indirect effects on marine biota) would be considered as part of any determination of a permit by the EA (or equivalent regulator). Under Option 3, RC dismantling to packaged waste will be undertaken up front. This will decrease the time available for decay of short lived isotopes and could lead to higher potential planned and unplanned radiological discharges when compared to any option that involves storage of either the RC or RPV. However, whilst there is the potential for operational activities to impact on water quality, it is assumed that the any discharges will be minimal and will remain well below statutory levels (being subject to stringent environmental permitting requirements with Best Available Techniques (BAT) principles adopted). That being said, if the safeguards were to fail there could be potentially a significant negative impact on water quality and marine environments, the magnitude of such effect would depend on the quality of water in receiving areas and proximity to sensitive sites (such as drinking water receptors, protected areas including SPAs and SACs). **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a potentially negative effect in relation to this objective. The volume of water required for and discharged as a result of processing activities, such as jet washing, damping and cutting, could have negative impacts on water resource, depending upon the existing levels of water stress and quality of water in receiving areas. Although there will be additional processing activities associated with dismantling the RPV to packaged waste and consequently increased volumes of water used and discharged compared to Option 2, it is considered to be of a scale unlikely to cause significant negative effects to water resources. Although the likelihood of accidental discharges during processing and movement of submarines are considered to be remote, in such an event there could be a potentially significant negative effect on water quality and marine environments, depending upon the quality of water in receiving waters and proximity to sensitive water receptors (such as drinking water receptors or protected areas including SPA and SACs).	**-**

Stage IV: Dismantle the Residual Submarine Hulls, and Process Wastes

Water Quality and Resources

All Options

Assessment of Effects:

Many of the operational activities at both initial dismantling and ship recycling sites, including cutting, dust separation and damping down, may use considerable volumes of freshwater. Water will also be required for potable purposes such as drinking water, as well as toilet and washing facilities at both sites. However, the quantities regarded for these activities is considered to be similar to those already used within current activities at the ship recycling facility and are therefore unlikely to affect the availability of water for other licensed water abstractors within the water resource zone at this site.

It is assumed that the submarines will have already been drained of the majority of liquids (such as oils, lubricating fluids, coolants and hydraulic fluids) prior to long term storage at the lay-up position. However, there is the possibility that residual liquids could remain within the submarine and these will be removed during the preparation of submarines for dismantling process at the initial dismantling facility. During the transfer of these liquids to secure containers, and whilst in storage, there is the potential for an accidental release of these contaminants. Whilst it is anticipated that there will be a number of measures to minimise any adverse effects (whether through the use of spill kits, or through oil traps), there remains the potential that these liquids or contaminated water could enter surface water drainage systems or affect any adjacent water bodies. However, the likelihood of such an event occurring is considered very low, given that environmental standards will be in place to prevent against this (such as environmental permitting requirements, application of BAT and the use of environmental containment and safeguards). Furthermore, given the small volumes considered to be remaining in the submarine should such a release occur it is considered that it is unlikely to have a considerably negative effect on water quality.

Hazardous wastes may be generated during the works, such as chromate paints during shot blasting or asbestos during removal of insulating materials. Environmental containment measures will be used to ensure that any dust and particulate matter associated with the removal of these materials will not be released (and so could eventually be deposited on surface water bodies). Similarly safeguards would be in place to prevent any accidental discharges of stored hazardous materials from leaving either the initial dismantling or ship recycling sites and impacting on surrounding rivers, estuaries or standing water. As a result, for all options, it is considered unlikely that there will be any significant impact from accidental discharges. However, if the safeguards were to fail there could be a potentially significant negative impact on water quality; the magnitude of such effect would depend on the quality of water in surrounding areas and proximity to sensitive receptors dependent on good water quality, such as SACs and SPAs.

There is risk of accidental discharge of potential contaminants (including fuel, oil and any remaining hazardous material) during the movement of the de-contaminated submarine from the initial dismantling facility to the ship recycling facility which could have a significant negative effect on water quality and marine environment along the transport route. This could include discharges as a result of a collision event, submarine grounding or a major fire event. However, it is considered that any such risk of accidental discharge is remote as the submarines will have undergone preparation for safe transportation, including watertight integrity. However, the risk of this movement negatively affecting the water environment will depend upon total distance travelled, the route of movement and the choice of transport method.

It is assumed that activities and techniques associated with submarine recycling will be similar to those already occurring at the existing ship recycling facility and as it will already be subject to regulatory requirements to ensure environmental standards are met, the risk of any breach to these standards is very low. For example, it is assumed that safeguards would be in place to prevent any accidental discharges from reaching water receptors. Therefore, it is assumed that there will be no expected negative effects on water related to the ship recycling activities.

Proposed Mitigation / Enhancements Measures:

- Use Environment Management Plan (EMP) and appropriate measures to minimise emissions of pollutants to air and water, for example, decanting waste liquids from the de-pollution process into the appropriate and approved waste containers for controlled disposal
- Conduct routine monitoring of surface water discharges to check with consented pH, BOD, and chemical levels etc.
- Measures to reduce the risk of pollution incidents and accidental discharge and to control the rates of water discharged from the site should be outlined within an EMS. These should follow best practice pollution prevention guidelines produced by the EA or equivalent bodies.
- The handling of any hazardous materials or fluids must be carried out in accordance with relevant best practice guidance and make use of

Stage IV: Dismantle the Residual Submarine Hulls, and Process Wastes Water Quality and Resources	
bunds and suitable storage tanks effectively providing sealed areas with adequate storage and collection facilities. • A Spillage Response Plan should be developed and implemented, which sets out systems to ensure that pollution effects are contained and minimised and that clean-up procedures and spill kits are in place to respond effectively once an incident is discovered. Training should be provided to all staff working on the site on the spill response procedures and periodic auditing of the procedures should take place. Sufficient spill kits should be provided and maintained and the contents should be subject to periodic checks.	
Summary: This stage has been assessed as having a neutral effect in relation to this objective. The volumes of water expected to be used during preparatory and recycling processes such as cutting and dust separation are considered to be unlikely to affect water availability for local abstractors at either the initial dismantling or ship recycling facilities. Although recycling of the submarines is likely to result in multiple sources of hazardous wastes which could contaminate water, including asbestos and chromate paints, it is considered that precautions will be in place to ensure safe disposal (such as specialist asbestos contractors) and contamination of water is considered unlikely. Given that the quantities of liquid wastes are considered to be low and environmental standards and best practice will be followed, the risk of accidental discharge affecting water quality is considered to be low. The likelihood of accidental discharges during transportation of the submarines is considered to be low, and as all radiological materials and most hazardous materials will be removed prior to movement, the risk of a negative effect on this objective is reduced.	**0**

Stage V: Transport the RC/RPV/ILW to Interim Storage Water Quality and Resources	
Option 1: Reactor Compartment Transport to Interim Storage	
Assessment of Effects: The effects of this option (which includes interim ILW storage itself) on water quality depends on how far the RC has to travel. If it is kept at or adjacent to the initial dismantling facility (known as the 'point of waste generation') then effects would be minimal. However, if RCs were taken to another coastal location to be stored, the effects could be more pronounced. This assessment has therefore assessed the impacts of moving the RC offsite to ensure that all potential effects are identified. It is assumed that the RC will be sealed prior to transportation and would meet with regulators' requirements, both of which would decrease the risk of discharges. Within this assumption it is therefore expected that there will be no water use during the preparation for transportation of RC and further that there would be discharges to water as a consequence. The risk of accidental discharge will depend upon the incident considered and its severity, the degree of incursion into the RC, the likely mobilisation of any contaminants as well as the distance travelled and the route taken. The significance of any potential radiological discharge would depend on the proximity to protected sites (such as SACs and SPAs where water quality was an important determinant of habitat or species). As the location of the dismantling and storage site is unknown remains uncertain. Moving RCs may require some channel modification work which could potentially affect aquatic and intertidal environments although this is dependent upon the location(s) and the choice of sea transportation method used. During the period of storage of RC, it is expected that due to the sealing of the RC and regular maintenance checks undertaken, the potential for the contamination of runoff during storage will be minimal. Further to this it is considered that any discharges from the interim storage facility and site will be to sewer. There remains a risk of an unplanned incident such as a major fire at the interim storage facility resulting in the release of radiological contaminants. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. If safeguards were to fail then there could be a significantly negative impact on water quality from the deposition of contaminants from any such fire. The significance of such an effect will depend upon location, proximity to surface or standing water and volumes discharged. **Proposed Mitigation / Enhancements Measures:** • Emergency response plan to address any potential unplanned events	
Summary: Option 1 has been assessed as having a neutral effect on this objective. This is primarily because the risks of breaching the RC during transportation or interim storage and this resulting in accidental discharge reaching water is considered very low.	**0**
Option 2: Reactor Pressure Vessel Transport to Interim Storage	
Assessment of Effects It is assumed that the RPV will be sealed into a purpose built container prior to transportation and would meet which with regulators requirements, both of which would decrease the risk of discharges. Within this assumption it is therefore expected that there will be no water use during the preparation for transportation of RPV and further that there would be no discharges to water as a consequence. The risk of accidental discharge will depend upon the incident considered and its severity, the degree of incursion into the RPV, the likely mobilisation of any contaminants as well as the distance travelled and the route taken. The significance of any potential radiological discharge would depend on the proximity to protected sites (such as SACs and SPAs where water quality was an important determinant of habitat or species). As the location of the dismantling and storage site is unknown remains uncertain. During the period of storage of RPV, it is expected that due to the packaging the RPV and regular maintenance checks undertaken, the	

Stage V: Transport the RC/RPV/ILW to Interim Storage Water Quality and Resources	
potential for the contamination of runoff during storage will be minimal. Further to this it is considered that any discharges from the interim storage facility and site will be to sewer. There remains a risk of an unplanned incident such as a major fire at the interim storage facility resulting in the release of radiological contaminants. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. If safeguards were to fail then there could be a significantly negative impact on water quality from the deposition of contaminants from any such fire. The significance of such an effect will depend upon location, proximity to surface or standing water and volumes discharged. **Proposed Mitigation / Enhancements Measures** • Emergency response plan to address any potential unplanned events	
Summary: Option 2 has been assessed as having a neutral effect on this objective. This is primarily because the risks of breaching the RPV during transportation or interim storage and this resulting in accidental discharge reaching water is considered very low.	**0**
Option 3: Packaged Waste Transport to Interim Storage	
Assessment of Effects: Given that the packaged waste will largely comprise of cut up steel, immobilised within a grout, any radiological discharge associated with the movement of each container will be exceptionally low. During the preparation of packaged waste for transport there is not expected to be any activities which require the use of water and further that there is not expected to be any water discharge as part of the transport preparation. It is therefore very difficult to consider circumstances under this option where radioactive elements could become mobilised and further lead to the contamination of a water body. No liquid ILW will be transported. There remains a risk of an unplanned incident such as a major fire at the interim storage facility resulting in the release of radiological contaminants. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. If safeguards were to fail then there could be a significantly negative impact on water quality from the deposition of contaminants from any such fire. The significance of such an effect will depend upon location, proximity to surface or standing water and volumes discharged. **Proposed Mitigation / Enhancements Measures** • Emergency response plan to address any potential unplanned events	
Summary: Option 3 has been assessed as having a neutral effect on this objective. This is primarily because the risks of breaching the packaged waste container during transportation or interim storage and this resulting in accidental discharge reaching water is considered very low.	**0**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF

Water Quality and Resources

Option 1: Size Reduce the Reactor Compartment and Transfer Packaged Waste to the Proposed GDF

Assessment of Effects:

Depending on where the RCs are stored and where they are to be finally dismantled, there may be a requirement to transport RCs. It is expected due to the size and weight of RC that this will only occur by sea and by barge or heavy lift vessel. As RCs will be sealed (in accordance with the Transport Regulations), it is not expected that there will be any discharge of radiological contaminants. It is also assumed that RCs would be passively safe (i.e. all liquids and potentially mobile radioactive materials would be removed or immobilised) and as such it is not expected that there will be any risk of accidental discharge of radiological contaminants during transportation.

Operational activities would generate several sources of water requiring discharge, including surface run-off, any effluent arising from water use on site and foul water. There may be discharges from the DBV. It is assumed that all discharges would be to a sewer, and where required, via an effluent treatment plant and that there would be no planned discharges to an open water body. Any potential effects on water quality (and its indirect effects on marine biota) from any unplanned releases (during localised flooding for example) would be considered as part of any determination of a permit by the EA (or equivalent regulator). Routine discharges are expected to be greater under this option than for Options 2 and 3 during this stage of the SDP process primarily due to the requirement for removal of RC components (for Options 2 and 3 these works would have been undertaken during Stage 3). However, as set out under the assessment of this option for Stage 3, the delay in works will result in a reduction of the total activity that could potentially be discharged to the environment during normal operations. In addition, delay (given that it will be at least 30 years before cut up begins) may provide sufficient time to enable new cut up techniques to be developed and applied (in accordance with the BAT), which should ensure that future operational discharges of both radiological emissions and non-radiological emissions will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain.

There is the potential for impacts (e.g. accidental release of pollutants and radioactive material) during RPV removal, including accidental release of untreated discharges. The significance of any potential radiological discharge would depend on the proximity to protected sites (such as SACs and SPAs where water quality was an important determinant of habitat or species). However, for all activities it is assumed that safeguards would be in place to prevent any accidental radioactive and non-radioactive discharges from reaching an environmental receptor and operational activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. Overall therefore, it is considered unlikely that there will be any significant impact on water quality from accidental discharges.

Dismantling of the RC to packaged waste during Stage 6, which is expected to include activities such as cutting, dust suppression and damping down, will use considerable volumes of freshwater. Water will also be required for potable purposes such as drinking water, as well as toilet and washing facilities. Depending on the local water resource availability and demand at the site, there could be the potential for water use to affect the availability of water for other licensed water abstractors within the water resource zone. The potential effects on water resources would be assessed in the determination of abstraction licenses by Environment Agency (EA) or equivalent regulator.

As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated risks on adjacent sensitive receptors, there is only a remote likelihood of any accidental discharges during transport. Further the route of the transport is not known and therefore the risk to sensitive receptors cannot be assessed. Therefore it is determined that transportation of packaged waste is not expected to pose any effect to water, under normal operating circumstances.

Once the RPV has been removed the remaining RC casing, which is expected to be non radioactive, will be cut up and size reduced on site. All items removed or size reduced from the RC casing will be monitored, characterised and transferred to a suitable waste processing facility for recycling or disposal as appropriate. However, it is uncertain as to where the cut up and size reduction of the RC casing will take place within the SDP site and subsequently the level of shielding that will be provided. Nonetheless the generation of any emissions from this activity is unlikely to be greater than that already experienced from other activities within the SDP site and consequently unlikely to have an adverse effect when compared to the current baseline.

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF

Water Quality and Resources

Proposed Mitigation / Enhancements Measures:

- Conduct routine monitoring of surface water discharges to check with consented pH, BOD, and chemical levels etc.
- Measures to reduce the risk of pollution incidents and accidental discharge and to control the rates of water discharged from the site should be outlined within an EMS. These should follow best practice pollution prevention guidelines produced by the EA or equivalent bodies. All discharges off-site would be agreed with the EA or equivalent body. Discharges to surface water or groundwater would require EA consent.
- The handling of any hazardous materials or fluids must be carried out in accordance with relevant best practice guidance and make use of bunds and suitable storage tanks effectively providing sealed areas with adequate storage and collection facilities.
- A Spillage Response Plan should be developed and implemented, which sets out systems to ensure that pollution effects are contained and minimised and that clean-up procedures and spill kits are in place to respond effectively once an incident is discovered. Training should be provided to all staff working on the site on the spill response procedures and periodic auditing of the procedures should take place. Sufficient spill kits should be provided and maintained and the contents should be subject to periodic checks.

Summary: Option 1 has been assessed as having a potentially negative effect in relation to this objective. Water will be required for RC dismantling to packaged waste and its use could have negative impacts on water resources, depending upon the existing levels of water stress and quality of water in receiving areas. Operational activities will also generate several sources of water requiring discharge such that discharge from the site could affect the water quality and/or rate of flows of receiving waters. Although the likelihood of accidental discharges during this stage are considered to be remote, in such an event there could be a potentially significant negative effect on water quality and marine environments, depending upon the quality of water in receiving waters and proximity to sensitive water receptors (such as drinking water receptors or protected areas including SPA and SACs).	-

Option 2: Size Reduce the Reactor Pressure Vessel and Transfer Packaged Waste to the Proposed GDF

Assessment of Effects:

The potential effects are similar to the range of effects described in Option 1. When considering the transportation of the RPV to the size reduction facility it is expected, regardless of transportation option, that there will not be any effects on this objective.

Dismantling of the RPV to packaged waste is expected to use less water than Option 1 as the scope of the activities will have reduced.

It is assumed that cutting and processing, as part of the size reduction activities, will take place within the shielded interior of the size reduction facility where there will be containment of any water, which will then be discharged, via an on site effluent treatment plant to sewer.

There is the potential for accidental release of pollutants and radioactive material during size reduction of the RPV, including accidental release of untreated discharges or flooding within the size reduction facility. However, these irradiated materials are unlikely to be in a soluble or mobile state and in total, are anticipated to be less than for Option 1.

The requirement to use BAT within the processes will ensure minimal pollutant emissions (of particulates, contaminated water) and the risks of any accidental radiological discharge would be very low.

For all options, it is considered unlikely that there will be any significant impact from accidental discharges. However, if the safeguards were to fail there would be potentially a significant negative impact on water quality and marine environments, the magnitude of such effect would depend on the quality of water in receiving areas and proximity to sensitive sites (such as drinking water receptors, protected areas including SPAs and SACs).

As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated risks on adjacent sensitive receptors, there is only a remote likelihood of any accidental discharges during transport. Further the route of the transport is not known and therefore the risk to sensitive

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF **Water Quality and Resources**

receptors cannot be assessed. Therefore it is determined that transportation of packaged waste is not expected to pose any effect to water, under normal operating circumstances.

Proposed Mitigation / Enhancements Measures:

- No additional mitigation measures proposed above those set out for Option 1

Summary: Option 2 has been assessed as having a *potentially* negative effect in relation to this objective. Water will be required for RPV dismantling to packaged waste, and any discharges would require treatment at an ETP on site prior to discharge to the sewer. Although the likelihood of accidental discharges are considered to be remote, in such an event there could be a potentially significant negative effect on water quality and marine environments, depending upon the quality of water in receiving waters and proximity to sensitive water receptors (such as drinking water receptors or protected areas including SPA and SACs).	**0/-**

Option 3: Transport Packaged Waste to the Proposed GDF

Assessment of Effects:

Under Option 3 all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process) and consequently, effects on this objective will relate to the transportation of packaged waste to the proposed GDF only.

It is considered unlikely that there will be any significant impact from accidental discharges. However, if the safeguards were to fail through an unplanned event such as a fire or explosion (which are considered unlikely) there would be potentially a significant negative impact on water quality and marine environments, the magnitude of such effect would depend on the quality of water in receiving areas and proximity to sensitive sites (such as drinking water receptors, protected areas including SPAs and SACs).

As a high end estimate, it is assumed that each container of packaged is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated risks on adjacent sensitive receptors, there is only a remote likelihood of any accidental discharges during transport. Further, the route of the transport is not known and therefore the risk to sensitive receptors cannot be assessed. Therefore it is determined that transportation of packaged waste is not expected to pose any effect to water, under normal operating circumstances.

Proposed Mitigation / Enhancements Measures:

- No additional mitigation measures proposed above those set out for Option 1

Assumptions and Uncertainties:

- As the options identified are not site specific, the proximity to sensitive local receptors, such as designated sites and drinking water receptors, is unknown and it is therefore not possible to determine the impact development would have on these features.

Summary: Option 3 has been assessed as having a neutral effect in relation to this objective as there are no additional processing activities associated with the option beyond the transportation of packaged waste to the proposed GDF. Any risks of accidental discharges from transport are considered exceptionally small.	**0**

Stage VII: Decommission SDP Facilities Water Quality and Resources
Option 1: Decommission Greenfield Sites

Assessment of Effects:

Water would be required throughout decommissioning for use in activities such as demolition, dust suppression and land remediation. During decommissioning, water would also be required for potable purposes such as drinking water, as well as toilet and washing facilities. Potential sources of supply include the use of mains supply water or surface or groundwater abstraction.

Depending on local water resource availability and demand at the site, there would be the potential for water use to affect the availability of water for other licensed water abstractors within the water resource zone. The potential effects on water resources would be assessed in the determination of any new abstraction licenses by the Environment Agency (EA) or equivalent regulator.

Decommissioning activities such as demolition would generate several sources of water requiring discharge, including surface run-off, groundwater from dewatering, any effluent arising from water use on site and foul water. Discharge from the site could affect the water quality and/or rate of flows of receiving waters.

Surface run-off could contain contaminants released through spillage of materials used during demolition such as chemicals and fuels.

Decommissioning activities will involve the demolition, excavation, movement and treatment of radiologically contaminated material, particularly arising from the size reduction facility (e.g. the hot cell). Most radiologically contaminated materials are expected to be solid, comprising a selection of concrete and cut up apparatus such as pipes and cladding although there is some potential that small amounts of liquids (crud and sludge) from the effluent treatment plant will be present, the discharge of which could significantly impact upon water quality/resources. However, it is assumed that all activities will be subject to BAT and ALARP and that containment mechanisms would be in place to prevent discharge to the environment. There is a potential risk of accidental discharge of radiation during decommissioning although the probability of any such discharges having a significant impact on water will be low given that decommissioning activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. These requirements will ensure that any discharges to the environment are both minimised, and within the limits defined in the site permit.

It is generally expected that the scale of demolition and decommissioning of facilities built on greenfield land will be greater than for the other generic land use options as it is assumed that all/most of the infrastructure and ancillary facilities will be required to be removed. As a result, there will be a greater use of water during decommissioning than for the other options and the potential significance of such effects will be greatest.

The potential effects on water resources and the quality of any receiving waters will depend on the nature, quality and significance of both. However, it is assumed for the purposes of the assessment that existing water quality and quality of aquatic environments will be high in the environs of a greenfield site.

It is generally assumed that decommissioning of SDP facilities constructed on greenfield land will reduce the potential risk of flooding through removal of hardstanding and other impermeable surfaces and a return to the previous state of land characterisation with the potential benefits of retaining coastal defences developed during the construction of any facilities in coastal locations. However, sites in coastal locations may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions, such that the run-off rates and flow pathways are unlikely to be the same as prior to development but are likely to be similar to that which would have been experienced at the sites if the development had not taken place.

Returning SDP sites to a greenfield state will help improve water quality in the local area in the long term. It is also assumed that aquatic and intertidal environments that were affected by the construction of docking facilities will be restored to the condition they were in prior to development and there is potential to enhance these environments further.

Following completion of decommissioning activities, there would be no further use of water associated with SDP activities. This is expected to have a positive effect on water resources in the long term.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for

Stage VII: Decommission SDP Facilities Water Quality and Resources	
each of the interim storage options are set out under Stage 2 of this assessment. RC storage will require decommissioning of a relatively large interim ILW storage facility compared to RPV and Packaged Waste options and, on a greenfield site, removal of docking facilities would also be required. Therefore, it is expected that greater volumes of water will be required for decommissioning activities increasing the potential to negatively affect water availability compared to the other technical options. Increasing decommissioning activities will lead to greater volumes of discharge increasing the potential to negatively affect water quality or water flow rates in receiving waters. Due to the need to transport RCs (and, potentially, RPVs) by sea, it is assumed that RC/RPV interim storage facilities will be developed in coastal locations. Under these storage options there may be potential to retain coastal defences developed during construction although sites may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions such that the run-off rates and flow pathways are unlikely to be the same as prior to development but are likely to be similar to that which would have been experienced at the sites if the development had not taken place. **Proposed Mitigation / Enhancements Measures:** • Potential sources of water resources for use during works should be identified at an early stage and abstraction from the source should result the lowest environmental effect possible. • Measures to reduce the risk of pollution incidents and accidental discharge and to control the rates of water discharged from the site should be outlined within an EMP. These should follow best practice pollution prevention guidelines produced by the EA or equivalent bodies. Measures could include the use of impermeable membranes, bunded and tanked fuel storage, double lined settlement lagoons and interceptors. All discharges off-site would be agreed with the EA or equivalent body. Discharges to surface water or groundwater would require EA consent. • Settlement lagoons should be adequately protected through the use of double linings to prevent loss and appropriately sited to mitigate the risks of contaminating groundwater or surface water bodies in the case of flooding. • The handling of any hazardous materials or fluids must be carried out in accordance with relevant best practice guidance and make use of bunds and suitable storage tanks effectively providing sealed areas with adequate storage and collection facilities. • A Spillage Response Plan should be developed and implemented, which sets out systems to ensure that pollution effects are contained and minimised and that clean-up procedures and spill kits are in place to respond effectively once an incident is discovered. Training should be provided to all staff working on the site on the spill response procedures and periodic auditing of the procedures should take place. Sufficient spill kits should be provided and maintained and the contents should be subject to periodic checks. • Implementation of water efficiency and re-use measures on site (demand management techniques, grey water recycling and rain water harvesting) should be implemented where appropriate, to minimise demand for water resources and consequential environmental effects. • Where wastewater is not to be discharged to sewer it should be treated on site to acceptable standards before being discharged to local watercourses. On site treatment could include reedbeds and other sustainable treatment processes where appropriate, thereby adding biodiversity value to the site.	
Summary: Option 1 has been assessed as having a long term positive effect on this objective as following the completion of decommissioning activities, water quality and water use will be restored to levels prior to development. Furthermore, following the removal of docking facilities from sites there is an opportunity to enhance the aquatic environment in these areas to a level greater than that prior to development. It is assumed that the removal of impermeable surfaces and land restoration will restore land characteristics so that it is expected that surface run-off and flow pathways will be similar to that expected on the site if the development had not occurred. There is also the possibility that any coastal defences added during development could be retained to decrease flood risk. However, the extensive decommissioning and demolition activities associated with Option 1 are likely to have a negative effect on water quality and the need to use considerable volumes of water could significantly affect water resources in the short to medium term, depending upon the existing levels of water stress. RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste options and it is therefore expected that greater volumes of water will be required for decommissioning activities, increasing the	**--/+**

Stage VII: Decommission SDP Facilities Water Quality and Resources	
potential to negatively affect water availability. Increasing decommissioning activities will lead to greater volumes of discharge increasing the potential to negatively affect water quality or water flow rates in receiving waters.	

Option 2: Decommission Brownfield Sites

Assessment of Effects:

As for Option 1, water will be required for both decommissioning activities and potable purposes. The potential sources of supply will remain the same (including the use of mains supply water or surface or groundwater abstraction). However, given that the majority of ancillary infrastructure will not need to be removed (as they were already in place prior to development), the overall scale of decommissioning will be less than for Option 1 and consequently the demand for water will be reduced. This will decrease the potential of adversely affecting the availability of water for other licensed water abstractors within the water resource zone, although this will also depend on local water resource availability.

However, the scale of decommissioning is such that the existing water resources may still be impacted. Furthermore, it may be expected that as a brownfield site is more likely to be in a developed area the existing demand for water/levels of water stress may be greater. The potential effects on water resources would be assessed in the determination of any new abstraction licenses by the Environment Agency (EA) or equivalent regulator.

Decommissioning activities will involve the demolition, excavation, movement and treatment of radiologically contaminated material, particularly arising from the size reduction facility (e.g. the hot cell). Most radiologically contaminated materials are expected to be solid, comprising a selection of concrete and cut up apparatus such as pipes and cladding although there is some potential that small amounts of liquids (crud and sludge) from the effluent treatment plant will be present, the discharge of which could significantly impact upon water quality/resources. However, it is assumed that all activities will be subject to BAT and ALARP and that containment mechanisms would be in place to prevent discharge to the environment. There is a potential risk of accidental discharge of radiation during decommissioning although the probability of any such discharges having a significant impact on soils will be low given that decommissioning activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. These requirements will ensure that any discharges to the environment are both minimised, and within the limits defined in the site permit.

The overall volumes of water discharged from construction activities and potential surface run off are likely to be less than for Option 1, which will decrease the risk of negatively affecting water quality or flows of rate of receiving waters.

There is potential for decommissioning activities to result in the mobilisation of previously entrapped contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water. However, it is assumed that any land contaminated during any of the SDP stages will be treated during the decommissioning process and that appropriate containment measures will be in place to prevent any unplanned contamination of surface water.

For brownfield sites, the majority of hardstanding will not need to be removed (as this would have been in place prior to development) and there should be reduced/minimal surface construction activities compared to Option 1. As a result, changes to surface drainage patterns or flow pathways and consequently flood risk should be less and are unlikely to cause a significant effect.

The potential effects on the quality of any receiving waters will depend on the nature, quality and significance of existing water quality. It may be possible that the existing water quality and quality of aquatic environment will be worse for a brownfield site than greenfield as it is expected to be in a more developed area. However, it is also possible that the brownfield site could be surrounded by a pristine environment or within close proximity to sensitive areas meaning that surrounding water and aquatic environment could be of a similar quality to greenfield areas.

It is generally assumed that decommissioning of SDP facilities constructed on brownfield sites will reduce the potential risk of flooding through a return to the previous state of land characterisation. Depending on the exact location of the facilities, there is potential that demolition could result in decreased flood risk as a result of reduced surface water runoff from the demolition of buildings and hardstanding. Although this is expected to have less effect than identified within Option 1, the level of potential flood risk is dependent on the scale and location of demolition and decommissioning activities, given that within a brownfield site it is expected that significant infrastructure and buildings will be left ‘in situ’ where appropriate.

However, coastally located sites may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions such that the run-off rates and flow pathways are unlikely to be the same as prior to development but are likely to be similar to that which would have been experienced at the sites if the development had not taken place.

Stage VII: Decommission SDP Facilities Water Quality and Resources	
Returning SDP sites to a brownfield state will help improve water quality in the local area in the long term. Following completion of decommissioning activities, there would also be no further use of water associated with SDP activities. This is expected to have a positive effect on water resources in the long term. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. RC storage will require decommissioning of a relatively large interim ILW storage facility compared to RPV and Packaged Waste options. Therefore, it is expected that greater volumes of water will be required for decommissioning activities increasing the potential to negatively affect water availability compared to the other technical options. Increasing decommissioning activities will lead to greater volumes of discharge increasing the potential to negatively affect water quality or water flow rates in receiving waters. Due to the need to transport RCs (and, potentially, RPVs) by sea, it is assumed that RC/RPV interim storage facilities will be developed in coastal locations. Under these storage options there may be potential to retain coastal defences developed during construction although sites may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions such that the run-off rates and flow pathways are unlikely to be the same as prior to development but are likely to be similar to that which would have been experienced at the sites if the development had not taken place. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: Option 2 has been assessed as having a long term positive effect on this objective as water quality and use at SDP sites will be improved from levels during operation, restoring levels to that prior to development. It is assumed that the removal of impermeable surfaces and land restoration will restore land characteristics so that it is expected that surface run-off and flow pathways will be similar to that expected on the site if the development had not occurred. There is also the possibility that any coastal defences added during development could be retained to decrease flood risk. Given that the scale of decommissioning will be considerably lower than for Option 1, the volumes of water required to support activities are expected to be lower although this option may still have a negative effect on existing water resources in the short to medium term depending upon the existing levels of water stress. Volumes of water discharged will also be considerably less and therefore less likely to negatively affect water quality. RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste options and it is therefore expected that greater volumes of water will be required for decommissioning activities, increasing the potential to negatively affect water availability. Increasing decommissioning activities will lead to greater volumes of discharge increasing the potential to negatively affect water quality or water flow rates in receiving waters.	**-/+**
Option 3: Decommission Existing Licensed/Authorised Sites	
Assessment of Effects: The range of required decommissioning and demolition activities that require water for Option 3 are considered to be similar to that of Option 2. However, given that the majority of ancillary infrastructure will not need to be removed (as they are likely to be in place prior to development), the overall scale of decommissioning will be less than for Option 1 (and, potentially, Option 2) and consequently the demand for water will be reduced. This will decrease the potential of adversely affecting the availability of water for other licensed water abstractors within the water resource zone, although this will also depend on local water resource availability. The potential effects on water resources would be assessed in the determination of any new abstraction licenses by the Environment Agency (EA) or equivalent regulator. Decommissioning activities will involve the demolition, excavation, movement and treatment of radiologically contaminated material, particularly	

Stage VII: Decommission SDP Facilities

Water Quality and Resources

arising from the size reduction facility (e.g. the hot cell). Most radiologically contaminated materials are expected to be solid, comprising a selection of concrete and cut up apparatus such as pipes and cladding although there is some potential that small amounts of liquids (crud and sludge) from the effluent treatment plant will be present, the discharge of which could significantly impact upon water quality/resources. However, it is assumed that all activities will be subject to BAT and ALARP and that containment mechanisms would be in place to prevent discharge to the environment. There is a potential risk of accidental discharge of radiation during decommissioning although the probability of any such discharges having a significant impact on soils will be low given that decommissioning activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. These requirements will ensure that any discharges to the environment are both minimised, and within the limits defined in the site permit.

Although the sources of water are likely to stay the same as for brownfield sites, the overall volumes of water discharged from demolition activities and potential surface run off are likely to be less, which will decrease the risk of negatively affecting water quality or flows of rate of receiving waters.

Similar to Option 2, there is potential for demolition activities to result in the mobilisation of previously entrapped contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water. However, it is assumed that any land contaminated during any of the SDP stages will be treated during the decommissioning process and that appropriate containment measures will be in place to prevent any unplanned contamination of surface water.

The potential effects on the quality of any receiving waters will depend on the nature, quality and significance of existing water quality. There is potential for the Licensed/Authorised site to be in close proximity to sensitive aquatic environments. Therefore, the impact is considered to be negative with the potential to be significant depending on the proximity of sensitive sites although this is currently unknown.

For Licensed/Authorised sites, the majority of hardstanding will not need to be removed (as this would have been in place prior to development) and there should be reduced/minimal surface construction activities compared to Options 1 and 2. As a result, changes to surface drainage patterns or flow pathways and consequently flood risk should be less and are unlikely to cause a significant effect.

Given the time period during which decommissioning is expected to occur, sites may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions such that the run-off rates and flow pathways are unlikely to be the same as prior to development but are likely to be similar to that which would have been experienced at the sites if the development had not taken place.

Following completion of decommissioning activities there would be no further use of water associated with SDP activities, which is expected to decrease the demand on water resources and improve water quality in the long term.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence of the technical options on their severity is also expected to be similar.

Proposed Mitigation / Enhancements Measures:

- No additional measures beyond those proposed for Option 1.

Summary: Option 3 has been assessed as having a long term positive effect on this objective as water quality and use at SDP sites will be restored to levels prior to development. It is assumed that the removal of impermeable surfaces and land restoration will restore land characteristics so that it is expected that surface run-off and flow pathways will be similar to that expected on the site if the development had not occurred. There is also the possibility that any coastal defences added during development could be retained to decrease flood risk. Given that the scale of decommissioning will be considerably lower than for Option 1 (and less than Option 2), the volumes of water required to support activities are also expected to be lower although this option may still have a negative effect on existing water resources in the short to medium term depending upon the existing levels of water stress. Volumes of water discharged	**-/+**

Stage VII: Decommission SDP Facilities Water Quality and Resources	
will also be considerably less and therefore less likely to negatively affect water quality. RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste options and it is therefore expected that greater volumes of water will be required for decommissioning activities, increasing the potential to negatively affect water availability. Increasing decommissioning activities will lead to greater volumes of discharge increasing the potential to negatively affect water quality or water flow rates in receiving waters.	

6.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the water quality and resources objective. **Box 6.2** provides a summary of the options that have been assessed.

Box 6.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 6.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
F. Water Maximise water efficiency, protect and enhance water quality.	-	-	-	**Potential Effects** Water would be required throughout the SDP, particularly during dismantling and segregation of the RC, including activities such as jet washing, water-jet cutting and dust separation and damping down, decontamination of removed components and RPV draining, which would use considerable volumes of freshwater; and during construction for use in construction activities (e.g. for cement mixing, cleaning machinery and dust suppression). Water would also be required for potable purposes such as drinking water, as well as toilet and washing facilities. Potential sources of supply include the use of mains supply water or surface or groundwater abstraction. Depending on local water resource availability and demand at the dockyards, there could be the potential for water use to affect the availability of water for other licensed water abstractors within the water resource zone *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by the EA or equivalent regulator. SDP activities would generate several sources of water requiring discharge, including surface run-off, any effluent arising from water use on site and foul water. There may be discharges from the DBV. It is assumed that all discharges would be either to a sewer, and where required, via an effluent treatment plant and that there would be no planned discharges to an open water body. However, there is the potential for accidental release of pollutants and radioactive material, including accidental release of untreated discharges, which could affect the water quality of receiving waters, e.g. accidental release of pollutants during construction such as silty run-off or surface water contaminated from spillage of materials such as chemicals and fuels; and accidental release of pollutants and radioactive material during initial dismantling (RC cut out) and segregation/size reduction (full dismantling of the RC following interim storage) operations, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There is also the potential for construction activities to result in the mobilisation of previously entrapped contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water. In addition, there is a risk of creating new pollution pathways for contaminants on the dockyards during construction, e.g. any intrusive ground works such as piling *(refer to impacts specific to the Devonport and Rosyth dockyards)*. SDP activities would be closely regulated and subject to stringent environmental permitting requirements, with any potential effects on water quality (and its indirect effects on marine biota) considered as part of any determination of a permit by the EA or equivalent regulator, and operational discharges of both radioactive and non-radioactive liquids, gases and solid wastes strictly managed. It is assumed that the radioactive discharges from SDP operations would be minimal due to the requirements that doses will be ALARP. The requirement to adopt BAT would also ensure minimal pollutant emissions. The risk of unacceptable or unplanned discharge is therefore considered to be very low and there is considered to be minimal risk of significant effects on water during normal operations. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments. It is expected that submarines will be wet towed into the dockyard. In the unlikely event that submarines are transported using a heavy left vessel, there is the potential for significant impacts on water quality and the aquatic and estuarine environment, from any dredging or channel modifications (*refer to impacts specific to the Devonport and Rosyth dockyards*).
F. Water Maximise water efficiency, protect	-	-	-	During submarine movement to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility there is a risk of accidental discharge of contaminants, including fuel and oils, which could have a negative effect on water quality and marine

Assessment Criteria	Score			Commentary
	1D	1R	1B	
and enhance water quality. *(continued)*				sediments. It is considered that any such risk is remote as submarines would have undergone preparation for safe transportation. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on water quality, although the likelihood of such an event occurring is exceptionally small. Of the technical options, the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2. The increased scale of development may result in greater levels of ground disturbance and would result in a larger impermeable area, and consequently any impact on water from the construction of SDP facilities could be greater for the RC option. However, in the case of the RC option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation/size reduction of the RC would not take place until the interim storage period is nearing completion. Separating activities into two phases could help to keep water use below threshold levels where it could affect water supplies, and similarly could help to reduce the risk of impacts on water quality as the level of activity being undertaken and the volume of water requiring discharge would be less. Although in the case of all of the technical options, as ALARP and BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on water during normal operations. The RC option is considered to carry the least risk of unplanned release of radioactive material associated with initial dismantling, as radioactive waste would be contained within the RC. As the RC option allows for the in-situ decay of short lived isotopes, following interim storage radioactivity levels would have reduced. However, the RC would need to be placed back into the DBV to remove the RPV, increasing the potential for accidental discharges into the basin when compared to the other technical options, which do not require use of the DBV following initial dismantling. The delay from interim storage before segregation begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. <u>Devonport Dockyard</u> Devonport dockyard is situated on the eastern shore of the Hamoaze estuary, which is part of the Plymouth Sound & Estuaries SAC. Weston Mill Creek flows to the north of 5 Basin. Natural streams through Devonport dockyard have been piped and now exist largely as surface water sewers discharging into the basins and estuary. Surface water run-off from impermeable areas in the dockyard is generally discharged to the basins and docks or to the sewerage network.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Devonport dockyard is situated within the Lower Tavy Water Resource Management Unit (WRMU) of the Tamar Catchment. In the 2007 Tamar Catchment Abstraction Management Strategy (CAMS) the Environment Agency classified the Lower Tavy WRMU as over-abstracted at low flows, and as such all new surface water licenses will have restrictions (existing licenses remain unaffected). Devonport dockyard holds four licenses permitting abstraction of water from the Hamoaze estuary for use in fire mains, cooling purposes etc. In 2008, water consumption at Devonport dockyard totalled 974,000m^3, a reduction of 321,000m^3 compared to 2007

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				(1,296,000 m^3 in 2007). In 2008, the maximum permitted abstraction volume was 8,690,424m^3. Devonport dockyard is not located within a Groundwater Source Protection Zone. In the made ground on which most of the shore facilities are sited at Devonport dockyard, groundwater is understood to be located at a depth of about 3m below ground level. In Devonport dockyard, the heavy metal content of the reclaimed ground fill material together with the salinity due to the esturial conditions is understood to impact on local groundwater quality. Groundwater levels are affected by the presence of the dock walls and whether or not the docks are dewatered. As a result of the underlying hydrogeology, groundwater within Devonport dockyard has naturally occurring radioactivity content, with radon daughter products evident. There are no known water quality issues within the Hamoaze estuary other than its proximity to Devonport dockyard and the river having a significant number of vessel movements, but the Hamoaze is subject at times to high sediment transport. Existing licensed activities at Devonport dockyard include permitted releases to sewer and the Hamoaze estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2007, nuclide concentrations were below the limits of detection in the majority of marine samples, such that Devonport dockyard's contribution to the natural background radiation dose was indistinguishable. A 2004 Natural England study reported that that radionuclides discharged into the Plymouth Sound & Estuaries SAC was of low radiological significance. As SDP activities at Devonport dockyard would be closely regulated and subject to stringent environmental permitting requirements, and taking account of current discharges, which are well below authorised limits, there is considered to be minimal risk of significant effects on water from SDP activities during normal operations at Devonport dockyard. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments, with the potential for impacts on the marine ecosystem of the Plymouth Sound & Estuaries SAC. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by the EA. However, taking account of the scale and nature of the activities proposed, which are similar to current activities being undertaken at Devonport dockyard, along with current levels of water consumption at the dockyard compared to permitted levels, the SDP is not expected to have any significant impact on water resource demand, although water resource availability could potentially be restricted during periods of low flow on the River Tavy.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. In the unlikely event that submarines are transported using heavy lift vessel significant dredging and channel modification would be required to create sufficient deep water (an estimated 300m wide area to a depth of 22-25+ metres would be required for heavy lift operations). The depth of water in those areas of Plymouth Sound that could be appropriate for heavy lift operations is estimated to be 15m. Taking account of this depth, dredging to 10m to create an area up to 25m deep and 300m wide would produce approx. 706,000 tonnes of dredged material. Sediment and bedrock depth is currently unknown. However, the depth to bedrock in Plymouth Sound has previously been reported as -39mOD. In the unlikely event that bedrock is encountered blasting would also need to be undertaken. At present, only very small amounts of maintenance dredging is undertaken at the dockyard each year. Maintenance dredging in the Lower Tamar is reported to account for the annual removal of 5,000 to 200,000 tonnes of sediment per year (based on tonnes of sediment dredged from the Tamar between 1985 and 2001). The dredging required for heavy lift operations would therefore be significant when compared to current dredging operations although it is considered unlikely that submarines will be transported by heavy lift vessel. Previous studies have determined that polycyclic aromatic hydrocarbons (PAHs), principally

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				from urban run-off, combustion and dockyard activities, are major contaminants in the lower part of the Tamar estuary. Any channel modification and dredging could impact on water quality (and consequently also marine ecosystems) due to the physical disturbance of estuary bed sediment, which could increase the concentration of suspended solids and turbidity of the water, and mobilise organic matter, nutrients and/or contaminants such as PAHs depending on the nature of the material in the dredging area. Disposal of dredged sediment on land or in water could also have an impact on surface water and/or groundwater, depending on the sensitivity of the receiving environment and method of disposal. As any dredging would be strictly regulated and BAT adopted, no significant impacts are anticipated during normal operations, although this would be dependent on the scale and location of any dredging that takes place and the presence of contaminants. <u>Rosyth Dockyard</u> Rosyth dockyard is situated on the eastern shore of the Firth of Forth Estuary. Brankholm Burn flows in an easterly direction approximately 0.6km to the north of Rosyth dockyard. Rosyth dockyard is understood to comprise a network of surface water drains and culverts. Surface water run-off from impermeable areas in the dockyard is generally discharged into the basins and docks or to the sewerage network. SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Rosyth dockyard is not located within a Scotland Drinking Water Protected Area for surface water or groundwater, and it is understood that there are no commercial or private surface water or groundwater abstractions within the vicinity of Rosyth dockyard. Rosyth dockyard is located on the Carboniferous Anstruther Formation classified as a moderately permeable or minor aquifer, which has limited potential for potable supply. Groundwater flow is likely to be driven by topographic gradient and flow southwards towards the Firth of Forth. Limited groundwater information is available for Rosyth dockyard. However, previous investigations of the land to the east of the dockyard found groundwater at depths of between approx. 1.19m and 2.50m below ground level.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	Soils beneath Rosyth dockyard predominantly comprise made ground. The extent of any contamination of the made ground is unknown. However, based on previous investigations of the land to the east of the dockyard (which also comprises made ground) it is understood that soils and leachate below the dockyard may exhibit elevated concentrations of metals and hydrocarbons. The water quality of the Lower Forth Estuary was classified as ‘good’ by SEPA in 2008; the ecological status of the water body is good and the chemical status has been classified as a ‘pass’. Existing licensed activities at Rosyth dockyard include permitted releases to sewer and the Firth of Forth estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. Tritium and Cobalt-14 discharges to the Firth of Forth estuary continue to decline and are well below authorised limits. As SDP activities at Rosyth dockyard would be closely regulated and subject to stringent environmental permitting requirements, and taking account of current discharges, which are well below authorised limits, there is considered to be minimal risk of significant effects on water from SDP activities during normal operations at Rosyth dockyard. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by SEPA. However, taking account of the scale and nature of the activities proposed, which are similar to current activities being undertaken at Rosyth dockyard, the SDP is not expected to have any impact on water resource demand. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any impacts on water associated with dredging and channel modification. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 1D could therefore potentially have a greater impact on water associated with construction activities within the dockyard, although no significant impacts are anticipated. The majority of the Rosyth dockyard lies within the floodplain, whereas only a small part of the Devonport dockyard lies within the floodplain. SDP activities at Rosyth dockyard could therefore be at greater risk of flooding, with a greater potential for adverse impacts on water quality from flooding with Option 1R. However, as SDP activities would be strictly managed and BAT principles adopted, the risk of a pollution incident occurring as a result of flooding at both Devonport dockyard and Rosyth dockyard is considered to be low. There may be a requirement for dredging within the estuary by Devonport dockyard to accommodate heavy lift operations, which would result in additional impacts on water when compared to Rosyth dockyard, where no channel modification is required. However as submarines are likely to be towed to Devonport dockyard for dismantling, dredging is unlikely to be required. Due to the potential requirement for dredging at Devonport dockyard, overall there is considered to be a greater potential for adverse impacts at Devonport dockyard when compared to Rosyth dockyard in relation to water.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	**-**	**-**	**-**	<u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster initial dismantling of laid-up submarines, which may reduce the potential for SDP activities to be affected by flooding. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. Overall, scale of potential effect of Option 1B could be greater than that of Options 1D and 1R as SDP facilities would need to be constructed at both dockyards, potentially resulting in greater water usage with increased potential for impacts on water quality.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score 2D	Score 2R	Score 2B	Commentary
F. Water Maximise water efficiency, protect and enhance water quality.	-	-	-	**<u>Potential Effects</u>** Water would be required throughout the SDP, particularly during dismantling and segregation of the RPV, including activities such as jet washing, water-jet cutting and dust separation and damping down, decontamination of removed components and RPV draining, which would use considerable volumes of freshwater; and during construction for use in construction activities (e.g. for cement mixing, cleaning machinery and dust suppression). Water would also be required for potable purposes such as drinking water, as well as toilet and washing facilities. Potential sources of supply include the use of mains supply water or surface or groundwater abstraction. Depending on local water resource availability and demand at the dockyards, there could be the potential for water use to affect the availability of water for other licensed water abstractors within the water resource zone *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by the EA or equivalent regulator.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	SDP activities would generate several sources of water requiring discharge, including surface run-off, any effluent arising from water use on site and foul water. There may be discharges from the DBV. It is assumed that all discharges would be either to a sewer, and where required, via an effluent treatment plant and that there would be no planned discharges to an open water body. However, there is the potential for accidental release of pollutants and radioactive material, including accidental release of untreated discharges, which could affect the water quality of receiving waters, e.g. accidental release of pollutants during construction such as silty run-off or surface water contaminated from spillage of materials such as chemicals and fuels; and accidental release of pollutants and radioactive material during initial dismantling (RPV removal) and size reduction (full dismantling of the RPV following interim storage) operations, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV during initial dismantling *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There is also the potential for construction activities to result in the mobilisation of previously entrapped contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water. In addition, there is a risk of creating new pollution pathways for contaminants on the dockyards during construction, e.g. any intrusive ground works such as piling *(refer to impacts specific to the Devonport and Rosyth dockyards)*. SDP activities would be closely regulated and subject to stringent environmental permitting requirements, with any potential effects on water quality (and its indirect effects on marine biota) considered as part of any determination of a permit by the EA or equivalent regulator, and operational discharges of both radioactive and non-radioactive liquids, gases and solid wastes strictly managed. It is assumed that the radioactive discharges from SDP operations would be minimal due to the requirements that doses will be ALARP. The requirement to adopt BAT would also ensure minimal pollutant emissions. The risk of unacceptable or unplanned discharge is therefore considered to be very low and there is considered to be minimal risk of significant effects on water during normal operations. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments. It is expected that submarines will be wet towed into the dockyard. During submarine movement to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility there is a risk of accidental discharge of contaminants, including fuel and oils, which could have a negative effect on water quality and marine sediments. It is considered that any such risk is remote as submarines would have undergone preparation for safe transportation. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on water quality, although the likelihood of such an event occurring is exceptionally small. Of the technical options, the scale of development required for the RPV would be less than that of the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2 and consequently any impact on water from the construction of SDP facilities could be less due to the reduced level of ground disturbance and impermeable area.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	In the case of the RPV option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation/size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases could help to keep water use below threshold levels where it could affect water supplies, and similarly could help to reduce the risk of impacts on water quality as the level of activity being undertaken and the volume of water requiring discharge would be less. Although in the case of all of the technical options, as ALARP and BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on water during normal operations. The likelihood of an unplanned release of radioactive material associated with initial dismantling is exceptionally low but slightly higher than for the RC option as the RPV would be removed from the reactor compartment in the case of this option. There is lower potential for the release of non-radiological pollutants to the environment at this stage when compared to the RC option as the RC would to some extent act as a shield during RPV removal and and the submarine hull would largely remain intact. The delay from interim storage before segregation begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. <u>Devonport Dockyard</u> Devonport dockyard is situated on the eastern shore of the Hamoaze estuary, which is part of the Plymouth Sound & Estuaries SAC. Weston Mill Creek flows to the north of 5 Basin. Natural streams through Devonport dockyard have been piped and now exist largely as surface water sewers discharging into the basins and estuary. Surface water run-off from impermeable areas in the dockyard is generally discharged to the basins and docks or to the sewerage network. EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Devonport dockyard is situated within the Lower Tavy WRMU of the Tamar Catchment. In the 2007 Tamar CAMS the Environment Agency classified the Lower Tavy WRMU as over-abstracted at low flows, and as such all new surface water licenses will have restrictions (existing licenses remain unaffected). Devonport dockyard holds four licenses permitting abstraction of water from the Hamoaze estuary for use in fire mains, cooling purposes etc. In 2008, water consumption at Devonport dockyard totalled 974,000m^3, a reduction of 321,000m^3 compared to 2007 (1,296,000 m^3 in 2007). In 2008, the maximum permitted abstraction volume was 8,690,424m^3. Devonport dockyard is not located within a Groundwater Source Protection Zone. In the made ground on which most of the shore facilities are sited at Devonport dockyard,

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				groundwater is understood to be located at a depth of about 3m below ground level.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	In Devonport dockyard, the heavy metal content of the reclaimed ground fill material together with the salinity due to the esturial conditions is understood to impact on local groundwater quality. Groundwater levels are affected by the presence of the dock walls and whether or not the docks are dewatered. As a result of the underlying hydrogeology, groundwater within Devonport dockyard has naturally occurring radioactivity content, with radon daughter products evident. There are no known water quality issues within the Hamoaze estuary other than its proximity to Devonport dockyard and the river having a significant number of vessel movements, but the Hamoaze is subject at times to high sediment transport. Existing licensed activities at Devonport dockyard include permitted releases to sewer and the Hamoaze estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2007, nuclide concentrations were below the limits of detection in the majority of marine samples, such that Devonport dockyard's contribution to the natural background radiation dose was indistinguishable. A 2004 Natural England study reported that that radionuclides discharged into the Plymouth Sound & Estuaries SAC was of low radiological significance. As SDP activities at Devonport dockyard would be closely regulated and subject to stringent environmental permitting requirements, and taking account of current discharges, which are well below authorised limits, there is considered to be minimal risk of significant effects on water from SDP activities during normal operations at Devonport dockyard. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments, with the potential for impacts on the marine ecosystem of the Plymouth Sound & Estuaries SAC. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by the EA. However, taking account of the scale and nature of the activities proposed, which are similar to current activities being undertaken at Devonport dockyard, along with current levels of water consumption at the dockyard compared to permitted levels, the SDP is not expected to have any significant impact on water resource demand, although water resource availability could potentially be restricted during periods of low flow on the River Tavy. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	<u>Rosyth Dockyard</u> Rosyth dockyard is situated on the eastern shore of the Firth of Forth Estuary. Brankholm Burn flows in an easterly direction approximately 0.6km to the north of Rosyth dockyard. Rosyth dockyard is understood to comprise a network of surface water drains and culverts. Surface water run-off from impermeable areas in the dockyard is generally discharged into the basins and docks or to the sewerage network. SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Rosyth dockyard is not located within a Scotland Drinking Water Protected Area for surface water or groundwater, and it is understood that there are no commercial or private surface water or groundwater abstractions within the vicinity of Rosyth dockyard. Rosyth dockyard is located on the Carboniferous Anstruther Formation classified as a moderately permeable or minor aquifer, which has limited potential for potable supply. Groundwater flow is likely to be driven by topographic gradient and flow southwards towards the Firth of Forth. Limited groundwater information is available for Rosyth dockyard. However, previous investigations of the land to the east of the dockyard found groundwater at depths of between approx. 1.19m and 2.50m below ground level. Soils beneath Rosyth dockyard predominantly comprise made ground. The extent of any

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				contamination of the made ground is unknown. However, based on previous investigations of the land to the east of the dockyard (which also comprises made ground) it is understood that soils and leachate below the dockyard may exhibit elevated concentrations of metals and hydrocarbons. The water quality of the Lower Forth Estuary was classified as 'good' by SEPA in 2008; the ecological status of the water body is good and the chemical status has been classified as a 'pass'. Existing licensed activities at Rosyth dockyard include permitted releases to sewer and the Firth of Forth estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. Tritium and Cobalt-14 discharges to the Firth of Forth estuary continue to decline and are well below authorised limits. As SDP activities at Rosyth dockyard would be closely regulated and subject to stringent environmental permitting requirements, and taking account of current discharges, which are well below authorised limits, there is considered to be minimal risk of significant effects on water from SDP activities during normal operations at Rosyth dockyard. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by SEPA. However, taking account of the scale and nature of the activities proposed, which are similar to current activities being undertaken at Rosyth dockyard, the SDP is not expected to have any impact on water resource demand. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any impacts on water associated with dredging and channel modification. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 2D could therefore potentially have a greater impact on water associated with construction activities within the dockyard, although no significant impacts are anticipated. The majority of the Rosyth dockyard lies within the floodplain, whereas only a small part of the Devonport dockyard lies within the floodplain. SDP activities at Rosyth dockyard could therefore be at greater risk of flooding, with a greater potential for adverse impacts on water quality from flooding. However, as SDP activities would be strictly managed and BAT principles adopted, the risk of a pollution incident occurring as a result of flooding at both Devonport dockyard and Rosyth dockyard is considered to be low. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster initial dismantling of laid-up submarines, which may reduce the potential for SDP activities to be affected by flooding. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. Overall, the scale of potential effect of Option 2B could be greater than that of Options 2D and 2R as SDP facilities would need to be constructed at both dockyards, potentially resulting in greater water usage with increased potential for impacts on water

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				quality.

Options 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
F. Water Maximise water efficiency, protect and enhance water quality.	-/?	-/?	-/?	**Potential Effects** Water would be required throughout the SDP, particularly during dismantling and segregation of the RPV, including activities such as jet washing, water-jet cutting and dust separation and damping down, decontamination of removed components and RPV draining, which would use considerable volumes of freshwater; and during construction for use in construction activities (e.g. for cement mixing, cleaning machinery and dust suppression). Water would also be required for potable purposes such as drinking water, as well as toilet and washing facilities. Potential sources of supply include the use of mains supply water or surface or groundwater abstraction. Depending on local water resource availability and demand, there could be the potential for water use to affect the availability of water for other licensed water abstractors within the water resource zone *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by the EA or equivalent regulator. SDP activities would generate several sources of water requiring discharge, including surface run-off, any effluent arising from water use on site and foul water. There may be discharges from the DBV. It is assumed that all discharges would be either to a sewer, and where required, via an effluent treatment plant and that there would be no planned discharges to an open water body. However, there is the potential for accidental release of pollutants and radioactive material, including accidental release of untreated discharges, which could affect the water quality of receiving waters, e.g. accidental release of pollutants during construction such as silty run-off or surface water contaminated from spillage of materials such as chemicals and fuels; and accidental release of pollutants and radioactive material during initial dismantling (RPV removal) and segregation/size reduction (full dismantling of the RPV following interim storage) operations, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV during initial dismantling *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There is also the potential for construction activities to result in the mobilisation of previously entrapped contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water. In addition, there is a risk of creating new pollution pathways for contaminants during construction, e.g. any intrusive ground works such as piling *(refer to impacts specific to the Devonport and Rosyth dockyards)*. In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation/size reduction (full dismantling of the RPV). Depending on the location of the remote site and its proximity to sensitive receptors, there is the potential for interim storage and segregation/size reduction activities to impact on water quality. At this stage a remote site has not been identified and consequently the potential for interim storage and segregation/size reduction activities to impact on water quality cannot be determined at this stage. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements, with any potential effects on water quality (and its indirect effects on marine biota) considered as part of any determination of a permit by the EA or equivalent regulator, and operational discharges of both radioactive and non-radioactive liquids, gases and solid wastes strictly managed. It is assumed that the radioactive discharges from SDP operations would be minimal due to the requirements that doses will be ALARP. The requirement to adopt BAT would also ensure minimal pollutant emissions. The risk of unacceptable or unplanned discharge is therefore considered to be very low and there is considered to be minimal risk of significant effects on water during normal operations. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-/?	-/?	-/?	It is expected that submarines will be wet towed into the dockyard. During submarine movement to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility there is a risk of accidental discharge of contaminants, including fuel and oils, which could have a negative effect on water quality and marine sediments. It is considered that any such risk is remote as submarines would have undergone preparation for safe transportation. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on water quality, although the likelihood of such an event occurring is exceptionally small. Of the technical options, the scale of development required for the RPV would be less than that of the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2. Consequently any impact on water from the construction of SDP facilities could be less due to the reduced level of ground disturbance and impermeable area. In addition, construction would also take place on two different sites, reducing any impacts from SDP activities as the scale of activity undertaken at the respective sites would be less. In the case of the RC option construction of SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases could help to keep water use below threshold levels where it could affect water supplies, and similarly could help to reduce the risk of impacts on water quality as the level of activity being undertaken and the volume of water requiring discharge would be less. Although in the case of all of the technical options, as ALARP and BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on water during normal operations. The likelihood of an unplanned release of radioactive material associated with initial dismantling is exceptionally low but slightly higher than for the RC option as the RPV would be removed from the reactor compartment in the case of this option. There is lower potential for the release of non-radiological pollutants to the environment at this stage when compared to the RC option as the RC would to some extent act as a shield during RPV removal and and the submarine hull would largely remain intact. The delay from interim storage before segregation begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-/?	-/?	-/?	<u>Devonport Dockyard</u> Devonport dockyard is situated on the eastern shore of the Hamoaze estuary, which is part of the Plymouth Sound & Estuaries SAC. Weston Mill Creek flows to the north of 5 Basin. Natural streams through Devonport dockyard have been piped and now exist largely as surface water sewers discharging into the basins and estuary. Surface water run-off from impermeable areas in the dockyard is generally discharged to the basins and docks or to the sewerage network. EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Devonport dockyard is situated within the Lower Tavy WRMU of the Tamar Catchment. In the 2007 Tamar CAMS the Environment Agency classified the Lower Tavy WRMU as over-abstracted at low flows, and as such all new surface water licenses will have restrictions

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				(existing licenses remain unaffected). Devonport dockyard holds four licenses permitting abstraction of water from the Hamoaze estuary for use in fire mains, cooling purposes etc. In 2008, water consumption at Devonport dockyard totalled 974,000m^3, a reduction of 321,000m^3 compared to 2007 (1,296,000 m^3 in 2007). In 2008, the maximum permitted abstraction volume was 8,690,424m^3. Devonport dockyard is not located within a Groundwater Source Protection Zone. In the made ground on which most of the shore facilities are sited at Devonport dockyard, groundwater is understood to be located at a depth of about 3m below ground level. In Devonport dockyard, the heavy metal content of the reclaimed ground fill material together with the salinity due to the esturial conditions is understood to impact on local groundwater quality. Groundwater levels are affected by the presence of the dock walls and whether or not the docks are dewatered. As a result of the underlying hydrogeology, groundwater within Devonport dockyard has naturally occurring radioactivity content, with radon daughter products evident. There are no known water quality issues within the Hamoaze estuary other than its proximity to Devonport dockyard and the river having a significant number of vessel movements, but the Hamoaze is subject at times to high sediment transport. Existing licensed activities at Devonport dockyard include permitted releases to sewer and the Hamoaze estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2007, nuclide concentrations were below the limits of detection in the majority of marine samples, such that Devonport dockyard's contribution to the natural background radiation dose was indistinguishable. A 2004 Natural England study reported that that radionuclides discharged into the Plymouth Sound & Estuaries SAC was of low radiological significance. As dismantling activities at Devonport dockyard would be closely regulated and subject to stringent environmental permitting requirements, and taking account of current discharges, which are well below authorised limits, there is considered to be minimal risk of significant effects on water from SDP activities during normal operations at Devonport dockyard. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments, with the potential for impacts on the marine ecosystem of the Plymouth Sound & Estuaries SAC. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by the EA. However, taking account of the scale and nature of the activities proposed, which are similar to current activities being undertaken at Devonport dockyard, along with current levels of water consumption at the dockyard compared to permitted levels, dismantling activities are not expected to have any significant impact on water resource demand, although water resource availability could potentially be restricted during periods of low flow on the River Tavy.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-/?	-/?	-/?	Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. <u>Rosyth Dockyard</u> Rosyth dockyard is situated on the eastern shore of the Firth of Forth Estuary. Brankholm Burn flows in an easterly direction approximately 0.6km to the north of Rosyth dockyard. Rosyth dockyard is understood to comprise a network of surface water drains and culverts. Surface water run-off from impermeable areas in the dockyard is generally discharged into the basins and docks or to the sewerage network. SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Rosyth dockyard is not located within a Scotland Drinking Water Protected Area for surface water or groundwater, and it is understood that there are no commercial or private surface

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				water or groundwater abstractions within the vicinity of Rosyth dockyard. Rosyth dockyard is located on the Carboniferous Anstruther Formation classified as a moderately permeable or minor aquifer, which has limited potential for potable supply. Groundwater flow is likely to be driven by topographic gradient and flow southwards towards the Firth of Forth. Limited groundwater information is available for Rosyth dockyard. However, previous investigations of the land to the east of the dockyard found groundwater at depths of between approx. 1.19m and 2.50m below ground level. Soils beneath Rosyth dockyard predominantly comprise made ground. The extent of any contamination of the made ground is unknown. However, based on previous investigations of the land to the east of the dockyard (which also comprises made ground) it is understood that soils and leachate below the dockyard may exhibit elevated concentrations of metals and hydrocarbons.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-/?	-/?	-/?	The water quality of the Lower Forth Estuary was classified as 'good' by SEPA in 2008; the ecological status of the water body is good and the chemical status has been classified as a 'pass'. Existing licensed activities at Rosyth dockyard include permitted releases to sewer and the Firth of Forth estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. Tritium and Cobalt-14 discharges to the Firth of Forth estuary continue to decline and are well below authorised limits. As SDP activities at Rosyth dockyard would be closely regulated and subject to stringent environmental permitting requirements, and taking account of current discharges, which are well below authorised limits, there is considered to be minimal risk of significant effects on water from SDP activities during normal operations at Rosyth dockyard. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by SEPA. However, taking account of the scale and nature of the activities proposed, which are similar to current activities being undertaken at Rosyth dockyard, the SDP is not expected to have any impact on water resource demand. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any impacts on water associated with dredging and channel modification. **Comparison of the Options** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. However, there may be a requirement for dredging within the estuary by Devonport dockyard to accommodate heavy lift operations, which would result in additional impacts on water when compared to Rosyth dockyard, where no channel modification is required. As any dredging would be strictly regulated and BAT adopted, no significant impacts are anticipated during normal operations, although this would be dependent on the scale and location of any dredging that takes place and the presence of contaminants. The majority of the Rosyth dockyard lies within the floodplain, whereas only a small part of the Devonport dockyard lies within the floodplain. SDP activities at Rosyth dockyard could therefore be at greater risk of flooding, with a greater potential for adverse impacts on water quality from flooding. However, as SDP activities would be strictly managed and BAT principles adopted, the risk of a pollution incident occurring as a result of flooding at both Devonport dockyard and Rosyth dockyard is considered to be low. At this stage a remote site for interim storage and segregation/size reduction has not been identified and subsequently the potential effect of these activities on water is uncertain. The potential for effects would depend on the location of the remote site and its land use, its

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				proximity to water resources and the scale of development required. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster dismantling of submarines, which may reduce the potential for SDP activities to be affected by flooding.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-/?	-/?	-/?	In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. Overall, the scale of potential effect of Option 3/4B could be greater than that of Options 3/4D and 3/4R as dismantling facilities would need to be constructed at both dockyards, potentially resulting in greater water usage with increased potential for impacts on water quality.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
F. Water Maximise water efficiency, protect and enhance water quality.	-	-	-	**Potential Effects** Water would be required throughout the SDP, particularly during dismantling and segregation of the RPV, including activities such as jet washing, water-jet cutting and dust separation and damping down, decontamination of removed components and RPV draining, which would use considerable volumes of freshwater; and during construction for use in construction activities (e.g. for cement mixing, cleaning machinery and dust suppression). Water would also be required for potable purposes such as drinking water, as well as toilet and washing facilities. Potential sources of supply include the use of mains supply water or surface or groundwater abstraction. Depending on local water resource availability and demand at the dockyards, there could be the potential for water use to affect the availability of water for other licensed water abstractors within the water resource zone *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by the EA or equivalent regulator. SDP activities would generate several sources of water requiring discharge, including surface run-off, any effluent arising from water use on site and foul water. There may be discharges from the DBV. It is assumed that all discharges would be either to a sewer, and where required, via an effluent treatment plant and that there would be no planned discharges to an open water body. However, there is the potential for accidental release of pollutants and radioactive material, including accidental release of untreated discharges, which could affect the water quality of receiving waters, e.g. accidental release of pollutants during construction such as silty run-off or surface water contaminated from spillage of materials such as chemicals and fuels; and accidental release of pollutants and radioactive material during initial dismantling (RPV removal) and segregation/size reduction (full dismantling of the RPV) operations, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV during initial dismantling *(refer to impacts specific to the Devonport and Rosyth dockyards)*.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	There is also the potential for construction activities to result in the mobilisation of previously entrapped contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water. In addition, there is a risk of creating new pollution pathways for contaminants on the dockyards during construction, e.g. any intrusive ground works such as piling *(refer to impacts specific to the Devonport and Rosyth dockyards)*. SDP activities would be closely regulated and subject to stringent environmental permitting requirements, with any potential effects on water quality (and its indirect effects on marine biota) considered as part of any determination of a permit by the EA or equivalent regulator, and operational discharges of both radioactive and non-radioactive liquids, gases and solid wastes strictly managed. The PW option is considered to carry a very small risk (but slightly higher than either RC or RPV options) of unplanned release of radioactive material associated with dismantling, as the RPV would be removed from the RC and would be fully dismantled ‘immediately’. The in-situ decay of short lived isotopes will not have occurred to the same extent as for the RC or RPV options and in consequence, this option involves management of material with higher levels of activity. Neverthless, the risk of unplanned radiological exposure is considered to be low because of the statutory safety requirements that are in place. The requirement to adopt BAT would also ensure minimal pollutant emissions. The risk of unacceptable or unplanned discharge is therefore considered to be very low and there is considered to be minimal risk of significant effects on water during normal operations. Notwithstanding this, if the safeguards were to fail there could potentially be a negative impact on water quality and marine environments.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				It is expected that submarines will be wet towed into the dockyard. During submarine movement to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility there is a risk of accidental discharge of contaminants, including fuel and oils, which could have a negative effect on water quality and marine sediments. It is considered that any such risk is remote as submarines would have undergone preparation for safe transportation. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on water quality, although the likelihood of such an event occurring is exceptionally small. Of the technical options, taking account of interim storage requirements the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with storage of PW expected to require1,005m^2. However, in the case of the PW option as it involves full early dismantling of the RPV and segregation/size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on water from SDP activities when compared to the RC and RPV options. As in the case of all of the technical options, as ALARP and BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on water during normal operations.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	<u>Devonport Dockyard</u> Devonport dockyard is situated on the eastern shore of the Hamoaze estuary, which is part of the Plymouth Sound & Estuaries SAC. Weston Mill Creek flows to the north of 5 Basin. Natural streams through Devonport dockyard have been piped and now exist largely as surface water sewers discharging into the basins and estuary. Surface water run-off from impermeable areas in the dockyard is generally discharged to the basins and docks or to the sewerage network. EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Devonport dockyard is situated within the Lower Tavy WRMU of the Tamar Catchment. In the 2007 Tamar CAMS the Environment Agency classified the Lower Tavy WRMU as over-abstracted at low flows, and as such all new surface water licenses will have restrictions (existing licenses remain unaffected). Devonport dockyard holds four licenses permitting abstraction of water from the Hamoaze estuary for use in fire mains, cooling purposes etc. In 2008, water consumption at Devonport dockyard totalled 974,000m^3, a reduction of 321,000m^3 compared to 2007 (1,296,000 m^3 in 2007). In 2008, the maximum permitted abstraction volume was 8,690,424m^3. Devonport dockyard is not located within a Groundwater Source Protection Zone. In the made ground on which most of the shore facilities are sited at Devonport dockyard, groundwater is understood to be located at a depth of about 3m below ground level. In Devonport dockyard, the heavy metal content of the reclaimed ground fill material together with the salinity due to the esturial conditions is understood to impact on local groundwater quality. Groundwater levels are affected by the presence of the dock walls and whether or not the docks are dewatered. As a result of the underlying hydrogeology, groundwater within Devonport dockyard has naturally occurring radioactivity content, with radon daughter products evident. There are no known water quality issues within the Hamoaze estuary other than its proximity to Devonport dockyard and the river having a significant number of vessel movements, but the Hamoaze is subject at times to high sediment transport.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				Existing licensed activities at Devonport dockyard include permitted releases to sewer and the Hamoaze estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2007, nuclide concentrations were below the limits of detection in the majority of marine samples, such that Devonport dockyard's contribution to the natural background radiation dose was indistinguishable. A 2004 Natural England study reported that that radionuclides discharged into the Plymouth Sound & Estuaries SAC was of low radiological significance. As SDP activities at Devonport dockyard would be closely regulated and subject to stringent environmental permitting requirements, and taking account of current discharges, which are well below authorised limits, there is considered to be minimal risk of significant effects on water from SDP activities during normal operations at Devonport dockyard. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments, with the potential for impacts on the marine ecosystem of the Plymouth Sound & Estuaries SAC. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by the EA. However, taking account of the scale and nature of the activities proposed, which are similar to current activities being undertaken at Devonport dockyard, along with current levels of water consumption at the dockyard compared to permitted levels, the SDP is not expected to have any significant impact on water resource demand, although water resource availability could potentially be restricted during periods of low flow on the River Tavy.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. <u>Rosyth Dockyard</u> Rosyth dockyard is situated on the eastern shore of the Firth of Forth Estuary. Brankholm Burn flows in an easterly direction approximately 0.6km to the north of Rosyth dockyard. Rosyth dockyard is understood to comprise a network of surface water drains and culverts. Surface water run-off from impermeable areas in the dockyard is generally discharged into the basins and docks or to the sewerage network. SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Rosyth dockyard is not located within a Scotland Drinking Water Protected Area for surface water or groundwater, and it is understood that there are no commercial or private surface water or groundwater abstractions within the vicinity of Rosyth dockyard. Rosyth dockyard is located on the Carboniferous Anstruther Formation classified as a moderately permeable or minor aquifer, which has limited potential for potable supply. Groundwater flow is likely to be driven by topographic gradient and flow southwards towards the Firth of Forth. Limited groundwater information is available for Rosyth dockyard. However, previous investigations of the land to the east of the dockyard found groundwater at depths of between approx. 1.19m and 2.50m below ground level.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	Soils beneath Rosyth dockyard predominantly comprise made ground. The extent of any contamination of the made ground is unknown. However, based on previous investigations of the land to the east of the dockyard (which also comprises made ground) it is understood that soils and leachate below the dockyard may exhibit elevated concentrations of metals and hydrocarbons. The water quality of the Lower Forth Estuary was classified as 'good' by SEPA in 2008; the ecological status of the water body is good and the chemical status has been classified as a 'pass'. Existing licensed activities at Rosyth dockyard include permitted releases to sewer and the Firth of Forth estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. Tritium and Cobalt-14 discharges to the Firth

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				of Forth estuary continue to decline and are well below authorised limits. As SDP activities at Rosyth dockyard would be closely regulated and subject to stringent environmental permitting requirements, and taking account of current discharges, which are well below authorised limits, there is considered to be minimal risk of significant effects on water from SDP activities during normal operations at Rosyth dockyard. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by SEPA. However, taking account of the scale and nature of the activities proposed, which are similar to current activities being undertaken at Rosyth dockyard, the SDP is not expected to have any impact on water resource demand. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any impacts on water associated with dredging and channel modification. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 1D could therefore potentially have a greater impact on water associated with construction activities within the dockyard, although no significant impacts are anticipated. The majority of the Rosyth dockyard lies within the floodplain, whereas only a small part of the Devonport dockyard lies within the floodplain. SDP activities at Rosyth dockyard could therefore be at greater risk of flooding, with a greater potential for adverse impacts on water quality from flooding. However, as SDP activities would be strictly managed and BAT principles adopted, the risk of a pollution incident occurring as a result of flooding at both Devonport dockyard and Rosyth dockyard is considered to be low.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-	-	-	Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation/size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage.

Options 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
F. Water Maximise water efficiency, protect and enhance water quality.	-/?	-/?	-/?	**Potential Effects** Water would be required throughout the SDP, particularly during dismantling and segregation of the RPV, including activities such as jet washing, water-jet cutting and dust separation and damping down, decontamination of removed components and RPV draining, which would use considerable volumes of freshwater; and during construction for use in construction activities (e.g. for cement mixing, cleaning machinery and dust suppression). Water would also be required for potable purposes such as drinking water, as well as toilet and washing facilities. Potential sources of supply include the use of mains supply water or surface or groundwater abstraction. Depending on local water resource availability and demand, there could be the potential for water use to affect the availability of water for other licensed water abstractors within the water resource zone *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by the EA or equivalent regulator. SDP activities would generate several sources of water requiring discharge, including surface run-off, any effluent arising from water use on site and foul water. There may be discharges from the DBV. It is assumed that all discharges would be either to a sewer, and where required, via an effluent treatment plant and that there would be no planned discharges to an open water body. However, there is the potential for accidental release of pollutants and radioactive material, including accidental release of untreated discharges, which could affect the water quality of receiving waters, e.g. accidental release of pollutants during construction such as silty run-off or surface water contaminated from spillage of materials such as chemicals and fuels; and accidental release of pollutants and radioactive material during initial dismantling (RPV removal) and segregation/size reduction (full dismantling of the RPV following interim storage) operations, including accidental release of untreated discharges or uncontrolled flooding or dewatering in the DBV during initial dismantling *(refer to impacts specific to the Devonport and Rosyth dockyards)*.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-/?	-/?	-/?	There is also the potential for construction activities to result in the mobilisation of previously entrapped contaminants, such as heavy metals, which if they were to reach water receptors/aquatic environments could have a potentially significant effect on the quality of water. In addition, there is a risk of creating new pollution pathways for contaminants during construction, e.g. any intrusive ground works such as piling *(refer to impacts specific to the Devonport and Rosyth dockyards)*. In the case of this option, following size reduction of the RPV, the PW would be transported off the segregation/size reduction site to a remote site for interim storage. Depending on the location of the remote site and its proximity to sensitive receptors, there is the potential for interim storage activities to impact on water quality. At this stage a remote site has not been identified and consequently the potential for interim storage activities to impact on water quality cannot be determined at this stage. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements, with any potential effects on water quality (and its indirect effects on marine biota) considered as part of any determination of a permit by the EA or equivalent regulator, and operational discharges of both radioactive and non-radioactive liquids, gases and solid wastes strictly managed. The PW option is considered to carry a very small risk (but slightly higher than either RC or RPV options) of unplanned release of radioactive material associated with dismantling, as the RPV would be removed from the RC and would be fully dismantled 'immediately'. The in-situ decay of short lived isotopes will not have occurred to the same extent as for the RC or RPV options and in consequence, this option involves management of material with higher levels of activity. Neverthless, the risk of unplanned radiological exposure is considered to be low because of the statutory safety requirements that are in place. The requirement to adopt BAT would also ensure minimal pollutant emissions. The risk of unacceptable or unplanned discharge is therefore

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				considered to be very low and there is considered to be minimal risk of significant effects on water during normal operations. Notwithstanding this, if the safeguards were to fail there could potentially be a negative impact on water quality and marine environments. It is expected that submarines will be wet towed into the dockyard. During submarine movement to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility there is a risk of accidental discharge of contaminants, including fuel and oils, which could have a negative effect on water quality and marine sediments. It is considered that any such risk is remote as submarines would have undergone preparation for safe transportation. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on water quality, although the likelihood of such an event occurring is exceptionally small. Of the technical options, taking account of interim storage requirements the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with storage of PW expected to require1,005m^2. However, in the case of the PW option as it involves full early dismantling of the RPV and segregation/size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on water from SDP activities when compared to the RC and RPV options. Notwithstanding this, construction would take place on two different sites, reducing any impacts from SDP activities as the scale of activity undertaken at the respective sites would be less. Although in the case of all of the technical options, as ALARP and BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on water during normal operations.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-/?	-/?	-/?	<u>Devonport Dockyard</u> Devonport dockyard is situated on the eastern shore of the Hamoaze estuary, which is part of the Plymouth Sound & Estuaries SAC. Weston Mill Creek flows to the north of 5 Basin. Natural streams through Devonport dockyard have been piped and now exist largely as surface water sewers discharging into the basins and estuary. Surface water run-off from impermeable areas in the dockyard is generally discharged to the basins and docks or to the sewerage network. EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Devonport dockyard is situated within the Lower Tavy WRMU of the Tamar Catchment. In the 2007 Tamar CAMS the Environment Agency classified the Lower Tavy WRMU as over-abstracted at low flows, and as such all new surface water licenses will have restrictions (existing licenses remain unaffected). Devonport dockyard holds four licenses permitting abstraction of water from the Hamoaze estuary for use in fire mains, cooling purposes etc. In 2008, water consumption at Devonport dockyard totalled 974,000m^3, a reduction of 321,000m^3 compared to 2007 (1,296,000 m^3 in 2007). In 2008, the maximum permitted abstraction volume was 8,690,424m^3. Devonport dockyard is not located within a Groundwater Source Protection Zone. In the made ground on which most of the shore facilities are sited at Devonport dockyard, groundwater is understood to be located at a depth of about 3m below ground level. In Devonport dockyard, the heavy metal content of the reclaimed ground fill material together with the salinity due to the esturial conditions is understood to impact on local groundwater quality. Groundwater levels are affected by the presence of the dock walls and

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				whether or not the docks are dewatered. As a result of the underlying hydrogeology, groundwater within Devonport dockyard has naturally occurring radioactivity content, with radon daughter products evident. There are no known water quality issues within the Hamoaze estuary other than its proximity to Devonport dockyard and the river having a significant number of vessel movements, but the Hamoaze is subject at times to high sediment transport. Existing licensed activities at Devonport dockyard include permitted releases to sewer and the Hamoaze estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. In 2007, nuclide concentrations were below the limits of detection in the majority of marine samples, such that Devonport dockyard's contribution to the natural background radiation dose was indistinguishable. A 2004 Natural England study reported that that radionuclides discharged into the Plymouth Sound & Estuaries SAC was of low radiological significance.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-/?	-/?	-/?	As SDP activities at Devonport dockyard would be closely regulated and subject to stringent environmental permitting requirements, and taking account of current discharges, which are well below authorised limits, there is considered to be minimal risk of significant effects on water from SDP activities during normal operations at Devonport dockyard. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments, with the potential for impacts on the marine ecosystem of the Plymouth Sound & Estuaries SAC. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by the EA. However, taking account of the scale and nature of the activities proposed, which are similar to current activities being undertaken at Devonport dockyard, along with current levels of water consumption at the dockyard compared to permitted levels, SDP activities are not expected to have any significant impact on water resource demand, although water resource availability could potentially be restricted during periods of low flow on the River Tavy. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. <u>Rosyth Dockyard</u> Rosyth dockyard is situated on the eastern shore of the Firth of Forth Estuary. Brankholm Burn flows in an easterly direction approximately 0.6km to the north of Rosyth dockyard. Rosyth dockyard is understood to comprise a network of surface water drains and culverts. Surface water run-off from impermeable areas in the dockyard is generally discharged into the basins and docks or to the sewerage network. SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-/?	-/?	-/?	Rosyth dockyard is not located within a Scotland Drinking Water Protected Area for surface water or groundwater, and it is understood that there are no commercial or private surface water or groundwater abstractions within the vicinity of Rosyth dockyard. Rosyth dockyard is located on the Carboniferous Anstruther Formation classified as a moderately permeable or minor aquifer, which has limited potential for potable supply. Groundwater flow is likely to be driven by topographic gradient and flow southwards towards the Firth of Forth. Limited groundwater information is available for Rosyth dockyard. However, previous investigations of the land to the east of the dockyard found groundwater at depths of between approx. 1.19m and 2.50m below ground level. Soils beneath Rosyth dockyard predominantly comprise made ground. The extent of any contamination of the made ground is unknown. However, based on previous investigations of the land to the east of the dockyard (which also comprises made ground) it is understood that soils and leachate below the dockyard may exhibit elevated concentrations of metals and hydrocarbons.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				The water quality of the Lower Forth Estuary was classified as 'good' by SEPA in 2008; the ecological status of the water body is good and the chemical status has been classified as a 'pass'. Existing licensed activities at Rosyth dockyard include permitted releases to sewer and the Firth of Forth estuary. The radionuclides include Cobalt-60, Carbon-14 and Tritium, as well as nuclides of lower radiological significance. Tritium and Cobalt-14 discharges to the Firth of Forth estuary continue to decline and are well below authorised limits. As SDP activities at Rosyth dockyard would be closely regulated and subject to stringent environmental permitting requirements, and taking account of current discharges, which are well below authorised limits, there is considered to be minimal risk of significant effects on water from SDP activities during normal operations at Rosyth dockyard. Notwithstanding this, if the safeguards were to fail there could potentially be a significant negative impact on water quality and marine environments. The potential for effects on water resources would be assessed in the determination of any new abstraction licenses by SEPA. However, taking account of the scale and nature of the activities proposed, which are similar to current activities being undertaken at Rosyth dockyard, the SDP is not expected to have any impact on water resource demand. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation should be possible. Submarine transportation to and from Rosyth dockyard is therefore not anticipated to result in any impacts on water associated with dredging and channel modification. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. There may also be a requirement for dredging within the estuary by Devonport dockyard to accommodate heavy lift operations, which would result in additional impacts on water when compared to Rosyth dockyard, where no channel modification is required. The majority of the Rosyth dockyard lies within the floodplain, whereas only a small part of the Devonport dockyard lies within the floodplain. SDP activities at Rosyth dockyard could therefore be at greater risk of flooding, with a greater potential for adverse impacts on water quality from flooding. However, as SDP activities would be strictly managed and BAT principles adopted, the risk of a pollution incident occurring as a result of flooding at both Devonport dockyard and Rosyth dockyard is considered to be low.
F. Water Maximise water efficiency, protect and enhance water quality. *(continued)*	-/?	-/?	-/?	At this stage a remote site for interim storage has not been identified and subsequently the potential effect of these activities on water is uncertain. The potential for effects would depend on the location of the remote site and its land use, its proximity to water resources and the scale of development required. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined.

A7. Air Quality

7.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on air quality. Information is presented for both national and sub-regional levels.

Air quality within this context concerns the levels of pollutants emitted into the air and their significance, in terms of the risk of adverse effects on the environment and/or human health. Carbon dioxide and other greenhouse gas emissions are excluded from the air quality topic and are reported under the climate change and adaptation topic.

There are links between the air quality topic and other topics in the SDP, specifically population, human health and well being, climate change and energy use, and material assets (transport).

7.2 Summary of Plans and Programmes

7.2.1 International

The ***Air Quality Framework Directive*** (96/62/EC) and its Daughter Directives set a framework for monitoring and reporting levels of air pollutants across EU member states, setting limits or reductions for certain air pollutants.

The ***Ambient Air Quality and Cleaner Air for Europe Directive*** (2008/50/EC) defines and establishes objectives and targets for ambient air quality to avoid, prevent or reduce harmful effects on human health and the environment as a whole.

The ***EU Thematic Strategy on Air Quality (2005)*** identifies that despite significant improvements in air quality across the EU, a number of serious air quality issues still persist. The strategy promotes an approach, which focuses upon the most serious pollutants, and that more is done to integrate environmental concerns into other policies and programmes. The objective of the strategy is to attain levels of air quality that do not give rise to significant negative impacts on and risks to human health and the environment. The strategy emphasises the need for a shift towards less polluting modes of transport and the better use of natural resources to help reduce harmful emissions.

7.2.2 National

UK

The ***Air Quality Standards Regulations (2010)*** transpose into UK law Directive 2008/50/EC on ambient air quality and cleaner air for Europe and Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclicaromatic hydrocarbons in ambient air. The objective of the Regulations is to improve air quality by reducing the impact of air pollution on human health and ecosystems. The standards set out air quality objectives, limit values and target values for pollutants, namely benzene, 1,3 butadiene, carbon monoxide, lead, nitrogen dioxide, PM_{10}, sulphur dioxide and PM_{25}.

The ***Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007)*** sets out a way forward for work and planning on air quality issues.

The ***Environment Act (1995)*** was enacted to protect and preserve the environment and guard against pollution to air, land or water. It requires local authorities to undertake local air quality management (LAQM) assessments against the standards and objectives prescribed in regulations. Where any of these objectives are not being achieved, local authorities must designate air quality management areas and prepare and implement remedial action plans to tackle the problem.

The ***Ozone-Depleting Substances (Qualifications) Regulations (2009)*** introduces controls on the production, use and emissions from equipment of a large number of "controlled substances" that deplete the ozone layer.

England

Planning Policy Statement 23(PPS23): Planning and Pollution Control (2004) sets out the governments planning policy in line with it's commitment to the principles of sustainable development and the importance of controlling and minimising pollution. An appendix to PPS23 sets out matters that should be considered in the preparation of development plan documents and when taking decisions on individual planning applications.

Scotland

Paper 2004/13: Policy Priorities Relevant to the Scottish Environment Protection Agency (2004) summarises policies and priorities of the Scottish Executive, which, together with the specific provisions in the Scottish Environmental Protection Agency's (SEPA's) Management Statement Financial Memorandum and SEPA's statutory powers and duties, form the main elements of the policy framework for SEPA's activities. Key target with reference to this topic is to minimise emissions of harmful pollutants to the air. Work within the UK strategy with a view to meeting by 2010 the targets in the National Emissions Ceilings Directive.

Wales

Planning Policy Wales: (Edition 2) (2010). Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Assembly Government. Regarding air quality, PPW sets out potential material planning considerations in relation to: location and site selection; impact on health and amenity; the risk and impact of potential pollution from the development as well as the effect of the surrounding environment, the prevention of nuisance and the impact on the road and other transport networks.

Northern Ireland

The ***Air Quality Standards Regulations (Northern Ireland) 2010*** transpose Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe, certain provisions of Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air, and Council Decision 97/101/EC on the exchange of information.

7.2.3 Sub-regional locations

Plymouth

Air quality priorities for Plymouth are set out within ***Plymouth City Council Core Strategy - Policy CS22 (Pollution).*** The policy seeks to protect people and the environment from unsafe, unhealthy and polluted environments through ensuring development causes no unacceptable impact on water or air quality. Plymouth City Council's ***Detailed Assessment of Air Quality in Plymouth (2004)*** details the latest review of air quality in Plymouth, assesses the likelihood of air quality objectives being exceeded and outlines any proposals for future air quality monitoring.

Fife

The Fife ***Air Quality Review And Assessment Progress Report for Fife Council (2009)*** details the latest review of air quality in Fife, assesses the likelihood of air quality objectives being exceeded and outlines any proposals for future air quality monitoring.

7.3 Overview of the Baseline

7.3.1 National

UK

Air quality in the UK is generally good. In 2008 urban background particulate levels averaged 20 micrograms per cubic metre (µg m-3) (Air Quality Strategy Objective and EU Limit Value is 40µg m-3); roadside particulate levels averaged 28 µg m-3; urban background ozone levels averaged 59 µg m-3; and rural ozone levels averaged 71 µg m-3.[304]

The annual per capita radiation dose to people in the UK from nuclear power station atmospheric discharges was 0.11µSv.[305] In the UK between 1985 and 2005 radioactive emissions to air fell by 83%.

In 2010, 234 Local Authorities in the UK (58% of all UK authorities) had declared Air Quality Management Areas (AQMAs), a designation made by a Local Authority where an assessment of air quality results in the need to devise an action plan to improve the quality of air.[306] AQMAs are predominantly in urban areas along busy and congested road networks and are generally related to nitrogen dioxide (NO_2) (in 93% of cases) and particulates (PM_{10}) (in 33% of cases). Transport is identified as the main source of pollution in 92% of all AQMAs.[306]

In the UK 26 days of moderate or high air pollution were recorded in urban areas, and 45 days of moderate or high air pollution were recorded in rural areas respectively in 2008.

The MOD's air quality effects are largely the result vehicle emissions from operational vehicles (green fleet), troop transport/business vehicles (white fleet), aircraft and shipping.[307]

England

Within England, in December 2009, there were 203 local authorities with AQMAs, 33 of which were within London. In 83.7% of cases the AQMA is required for NO_2 pollution and 31.5% they were required for PM_{10} pollution. In 94% of cases the source of pollution was from transport and 4.4% the source was

[304] Defra, Environment in your Pocket Statistics, 2009, http://www.defra.gov.uk/evidence/statistics/environment/eiyp/
[305] Health Protection Agency, Ionising Radiation Exposure of the UK Population: 2005 Review, http://www.hpa.org.uk/Publications/Radiation/HPARPDSeriesReports/HpaRpd001/
[306] Defra, Review of local air quality management, 2009, http://archive.defra.gov.uk/environment/quality/air/airquality/local/documents/laqm-report.pdf
[307] MOD, UK Defence Statistics, fact sheet 2009, http://www.dasa.mod.uk/applications/newWeb/www/index.php?page=48&pubType=1&thiscontent=1600&PublishTime=09:30:00&date=2010-09-29&disText=2010&from=listing&topDate=2010-09-29

from industry.[306]

Overall, trends in PM_{10} concentrations for all metrics in all parts of England appear to

have levelled out in recent years. However, four sites in England (London Marylebone Road, London Camden roadside, Brighton roadside and Bradford Centre) were over the 24 hour objective for PM_{10} meaning that more than the 35 days were recorded as being in exceedence of a 24-hour average value of 50 µg.m^{-3}.[308]

In 2003 it was estimated that 2161.7 km of road exceeded an annual mean value of 31.5 µg.m^{-3} (closely equivalent to the objective value), 935.9 km of which was within London making up 43.2% of the total length of road exceedance.[308]

In 2003 the population mean weighted $PM_{2.5}$ concentration for England (excluding London) was 14.4µg.m-^{3}, 17.4µg.m^{-3} in Inner London and 16.9 µg.m^{-3} in Outer London.[308]

Four sites in England (London Marylebone Road; London A3 roadside; Camden roadside and Bristol Old Market roadside) exceeded the AQS 1-hour objective for NO_2 meaning there were more than 18 exceedences of the 200 µg/m3 target in 2005.[308]

Scotland

In Scotland air quality is generally good, although this is not always the case when considering the more urban areas. No exceedences of the annual mean PM_{10} objective of 18µgm-3 at background locations were identified. However, 67 junctions were identified as exceeding the objective across Scotland, 60% of which were located in Glasgow Urban Area. With regard to NO_2, data from 53 sites utilising automatic monitoring are available for 2008. Fourteen roadside or kerbside automatic sites exceeded the UK Air Quality Strategy (AQS) Objective for the annual mean (40µgm-3) all of which are close to busy roads. Seven of these sites also exceeded the AQS Objective of 200µgm-3 for the hourly mean more than the permitted 18 times.

Provisional results from Scotland's network of automatic air quality monitoring stations in 2009 show that the AQS Objectives for carbon monoxide, benzene and 1,3-butadiene have been met by the due dates. However, there remained a number of sites close to busy roads in urban areas that did not meet the AQS Objectives for NO_2 and/or PM_{10}, together with several rural sites that did not meet the AQS

[308] Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Vol 2 (2007) http://archive.defra.gov.uk/environment/quality/air/airquality/strategy/documents/air-qualitystrategy-vol2.pdf

Objective for ozone.[309]

In 2010 there were 12 local authorities with AQMA's in Scotland. The major sources of air pollution are located in the more urban areas and as such, AQMAs are predominantly in urban areas and are generally related to NO_2 and PM_{10} emissions from vehicles.[310]

Wales

Air quality in Wales continues to improve year on year and both emissions and ambient concentrations of key pollutants are decreasing, though annual average concentrations across the country have started to level out in recent years. Urban air quality in Wales is generally worse than in rural areas. The main causes of pollution at urban sites are fine particles (PM_{10}) and ozone. The main cause of pollution in rural areas is the variation in ozone levels, which is affected by the weather. In 2008, the number of days when air pollution was moderate or higher was 26 in Cardiff and in 2008 was 104 in Port Talbot Margam. In 2010 there were 8 local authorities that had AQMA's..[311] The South-East Wales region has the worst air quality, followed by parts of North-East Wales. Moderate levels of ozone were recorded on 115 days during the year at one or more sites, and PM_{10} levels were moderate or high on 47 days.[312]

Northern Ireland

Northern Ireland's air quality has improved substantially in recent years. In particular, levels of pollutants associated with coal and oil combustion have reduced significantly over the past two decades. However, some pollutants in some parts of Northern Ireland continue to exceed air quality objectives.[313]

In 2008, the annual mean concentration of PM_{10} in urban areas was 20.0μg/m3 and at the Lough Navar rural background monitoring site, it was 12.0μg/m3. In the last ten years, the rural concentration of PM_{10} has been no higher than 15μg/m3 and the urban concentration has been less than 28μg/m3. All the readings in the last 10 years have been well below the 40μg/m3 level that has been set as the AQS objective for the protection of human health for PM_{10}.[6] No exceedances of PM_{10} objectives were identified in the most recent monitoring report for 2009. Of 18 sites automatically monitored for NO_2, four roadside or kerbside sites exceeded the AQS Objectives for NO_2 (annual mean of 40μgm-3), all of which are close to busy roads. One site also exceeded the AQS Objective of 200μgm-3 for the hourly mean

[309] http://www.scottishairquality.co.uk/documents/reports2/240090518_AQ_in__Scotland_2006_4F_JB_FF.pdf
[310] Defra, Review of Local Air Quality Management, 2009 http://archive.defra.gov.uk/environment/quality/air/airquality/local/documents/laqm-report.pdf
[311] Defra, Review of Local Air Quality Management, 2009 http://archive.defra.gov.uk/environment/quality/air/airquality/local/documents/laqm-report.pdf
[312] http://www.welshairquality.co.uk/documents//news/322100927_AQ_Wales_15_English_web.pdf
[313] Northern Ireland environmental statistics report 2010, www.doeni.gov.uk/northern_ireland_environmental_statistics_report_2010-2.pdf

more than the permitted 18 times.[314]

Results from Northern Ireland's network of automatic air quality monitoring stations in 2009 show that the AQS Objectives for carbon monoxide, benzene, 1,3-Butadene, ozone and sulphur dioxide have been met.

In Northern Ireland, in 2010 11 local authorities had declared AQMA's.[311] The majority of AQMA's in Northern Ireland, are located in urban areas and are generally related to NO_2 and PM_{10} emissions largely, from domestic fuel consumption and road transport.

7.3.2 Sub-regional locations

Plymouth

Air quality in Plymouth is generally good[315], with the key pollutants being NO_2 from traffic, and PM_{10} being an issue around the docks where china clay is handled. In 2009, annual average NO_2 levels in Plymouth were between 32 and 42.7µgm-3 against a statutory target of 40µgm-3. Annual average PM_{10} levels were 26µgm-3, against a statutory target of 50µgm-3 (although the limit was exceeded on 21 days).[316]

The average Combined Air Quality Index for Plymouth from the 2007 Indices of Deprivation was 1.11.[317] This represents the addition of the four indices (NO_2, PM_{10}, sulphur dioxide and benzene). A higher value implies poorer overall air quality. (The mean average of all Combined Air Quality Index scores for all Local Authority regions in England is 1.23).[318]

There are three AQMAs in Plymouth; two for exceedances of NO_2 and one for exceedance of PM_{10}. Plymouth City Council is considering replacing the two individual site AQMAs in the city centre with one larger AQMA area, which will include the main transport routes into the city.[319, 320]

The Devonport Royal Dockyard is licensed under the Nuclear Installations Act 1965. It has a radioactive waste management policy which requires a justification for any work which generates radioactive waste, and proof of control using Best Practicable Means (BPM). Airborne waste is discharged via authorised

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[314] Air Pollution in Northern Ireland 2009, http://www.airqualityni.co.uk/reports.php?n_action=report

[315] Plymouth City Council, Air Quality, http://www.plymouth.gov.uk/airquality

[316] Plymouth City Council, 2010 Air Quality progress report http://www.plymouth.gov.uk/2010_progress_report_final.pdf

[317] Indices of Deprivation, 2007 http://www.communities.gov.uk/communities/neighbourhoodrenewal/deprivation/deprivation07/

[318] Defra (2009) Local Air Quality Management – Technical Guidance http://www.defra.gov.uk/environment/quality/air/airquality/local/guidance/documents/tech-guidance-laqm-tg-09.pdf

[319] Plymouth City Council, 2010 Air Quality progress report http://www.plymouth.gov.uk/2010_progress_report_final.pdf

[320] Defra Air Information Resource (http://uk-air.defra.gov.uk/)

outlets which are monitored and declared to the Environment Agency.

Fife

Air quality in Fife is generally good.[321] In 2005 annual average background levels were: PM_{10}: 11.8 µgm-3; carbon monoxide: 0.12mgm-3; benzene: 0.15µgm-3; 3-butadiene: 0.03 µgm-3; NO_2: 5.69µgm-3; Annual average total NO_X: 7.25µgm-3.[322] No equivalent Combined Air Quality Index data is available for Scotland.

Fife District has only one AQMA within Bonnygate, Cupar[323]. However, there are no AQMAs covering Rosyth dockyard or its vicinity.

Fife has localised areas of elevated air quality pollutants associated with road transport. Longannet Power Station in Fife is also a major source of air pollution.[324]

In 2007, radioactive discharge licences to air were issued to Rosyth Royal Dockyard Ltd.[325] Industrial emissions have diminished significantly in Fife as a result of the reduction in heavy industry. The decrease in coal use in Fife, and across Scotland, has lead to a corresponding decrease in sulphur dioxide emissions, and lessened the acidification of natural systems.[326]

7.4 Existing problems

7.4.1 National

UK

Air quality has improved in the UK over the last sixty years as a result of the switch from coal to gas and electricity for heating of domestic and industrial premises, stricter controls on industrial emissions, higher standards for the composition of fuel and tighter regulations on emissions from motor vehicles. However, poor air quality - particularly from vehicles - remains a significant issue for community health

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[321] Fife Council, Air Quality Strategy, http://www.fifedirect.org.uk/atoz/index.cfm?fuseaction=service.display&objectid=9BEA61F5-84B3-4566-A6306430709B15B7

[322] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1

[323] Fife Council, Bonnygate AQMA order, http://www.fife.gov.uk/publications/index.cfm?fuseaction=publication.pop&pubid=9BC9C454-D24F-006A-2D604662DA3FA429

[324] SEPA Air Quality Report 2007, http://209.85.229.132/search?q=cache:fOcuu5BxlkIJ:www.sepa.org.uk/air/idoc.ashx%3Fdocid%3/4D5813436f-75a4-44c4-b8e1-98a5b4eef486%26version%3/4D-1+defra+days+of+moderate+or+high+AEA+Energy+and+Environment+fife&cd=9&hl=en&ct=clnk&gl=uk

[325] SEPA, Scottish Pollutant Release Inventory, http://apps.sepa.org.uk/SPRIPA/Search/ByLocalAuthority/Criteria.aspx

[326] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1

and for biodiversity, especially in/downwind of urban areas and major transport networks.

In 2005, 29% of monitoring sites within the UK exceeded the annual mean NO_2 objective of 40 $\mu g.m^{-3}$ and 4% of monitoring sites exceeded the 1 hour objective of 200 $\mu g.m^{-3}$ more than 18 times a year.[327]

In 2005, roughly 40% of the 85 monitoring network sites exceeded the Air Quality's Strategy objective for O_3.[327]

Air pollution is a significant cause of decline in the condition of 55 of UK SSSIs.[328] However, it is often very difficult to determine the effects of air pollution on SSSIs, given the complex interactions between pollution impacts, management and abiotic influences. As a result, the impacts of air pollution, and the identification of air pollution as an adverse activity affecting condition, are considered to be substantially under-reported.[328]

Research by the Government has found that in a number of urban areas, the least affluent members of society tend to be exposed to the highest levels of air pollution.[329] This is particularly the case in England, where AQMAs declared for NO_2 are often in the most socially deprived areas people in deprived communities exposed to 41% higher concentrations of NO_2 than those people living in average communities[330], although this is less marked in Wales and Scotland. The report concluded that measures to improve air quality can have a more pronounced effect in deprived areas and could help to reduce this social inequality.[331]

7.4.2 Sub-regional locations

For both the sub-regional baselines, air quality is considered good overall, when assessed against national air quality standards.

Plymouth

Areas of Plymouth are still exceeding NO_2 objectives set out in the Government's Air Quality Strategy. Two of these areas are included within the existing Air Quality Management Areas (Exeter Street and

[327] UK Air Quality Archive, www.airquality.co.uk/archive
[328] Joint Nature Conservation Committee (2006) Common Standards Monitoring for Designated Sites: First Six Year Report, http://www.jncc.gov.uk/pdf/CSM_06summary.pdf
[329] Dept. for Communities and Local Government (2006) Air Quality and Social Deprivation in the UK: an environmental inequalities analysis, www.airquality.co.uk/reports/cat09/0701110944_AQinequalitiesFNL_AEAT_0506.pdf
[330] UK Air Quality Archive, www.airquality.co.uk/archive
[331] Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007) http://www.official-documents.gov.uk/document/cm71/7169/7169_i.asp

Mutley Plain) and outside of the existing AQMA's one exceedance for NO_2 was measured.[332]

A number of residential, commercial and community development proposals have been identified by Plymouth City Council as having the potential to have an significant impact on air quality.[332] However, measures are being put into place by the council to ensure that the air quality impact of these developments is fully taken into account and that they are mitigated or compensated for as appropriate.

Fife

Both the NO2 and PM10 annual mean objectives were exceeded in 2008 in Fife's only AQMA situated in Bonnygate, Cupar. Emissions from private cars and HGVs contribute the largest proportions to these local emissions although queuing of all vehicle classes is another important source.[333]

7.5 Likely evolution of the baseline

7.5.1 National

The current trend in air condition is generally towards improved air quality, both in rural and urban settings.[334]

Between 1990 and 2008 there is no clear long-term trend in ozone levels with increases in urban background ozone levels of 40.5%, however between 1980 and 2007 nitrogen oxides (NOx) fell by 42%, particulates (PM_{10}) fell by 59% and sulphur dioxide (SO2) by 84% (between 1990 and 2007).[335]

Reductions are a product of: improved technology; changes in energy generation; targeted air quality management policies; and reductions in specific greenhouse gases, CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

Projections of UK total emissions:[336]

Best case scenario (full air quality target compliance):

- NOx: 2010 = 1136.4 ktonnes/yr; 2015 = 963.1 ktonnes/yr; 2020 = 799.1 ktonnes/yr; and
- PM10: 2010 = 133.5 ktonnes/yr; 2015 = 129.4 ktonnes/yr; 2020 = 134.4 ktonnes/yr.

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332 Plymouth City Council (2010) Air quality progress report for Plymouth, http://www.plymouth.gov.uk/airquality

333 Fife County Council (2010) Further Assessment of Air Quality, Bonnygate, Cupar http://www.fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=35D57699-9914-11E2-95459B24F8ED9223

334 http://www.defra.gov.uk/sustainable/government/progress/documents/SDIYP2009_a9.pdf

335 http://www.defra.gov.uk/evidence/statistics/environment/eiyp/

336 http://www.airquality.co.uk/reports/reports.php?action=category&section_id=17

Worst case scenario (extension of 2003 baseline):

- NOx: 2010 = 1151.0 ktonnes/yr; 2015 = 1030.3 ktonnes/yr; 2020 = 910.7ktonnes/yr;

Measurements and modelling show that, without further measures, objectives for particles such as particulate matter (PM10), nitrogen dioxide (NO2), ozone (03) and polycyclic aromatic hydrocarbons (PAHS) are unlikely to be achieved in some parts of urban areas within the UK.[337]

Radioactive emissions to air in the UK fell by around 76 per cent between 1985 and 2003.[338]

England

PM_{10} pollution overall has been decreasing in recent years and this is predicted to continue in the future. By 2015 71.7km of main urban road is predicted to be in exceedance of 31.5 µg/m^3 (roughly equivalent to the Stage 1 PM10 24-hour limit value and objective), this is a 96.7% decrease compared to the 2003 baseline.[339]

Concentrations of NO_2 have been declining on average, although London Marylebone Road (the site with the highest NO_2 levels in England) and several other sites, are showing increasing concentrations in the most recent years. By 2015, 1,331 km of main urban road is predicted to be in exceedence of the annual mean objective of 40 µg.m^{-3}, this is an 80.2% decrease compared to the 2003 baseline.

Scotland

In general, recent years have seen a marked improvement in Scotland's air quality. In particular, levels of pollutants associated with motor vehicle and industrial emissions have declined significantly over the past decade. There has been a smooth and clear long-term improvement in NOx concentrations due to the progressive reductions in emissions from combustion sources delivered by UK and EC policies. There has been an increase in background ozone over time; this is small but detectable at rural and remote locations in Scotland, but dramatic and relatively clear at urban background locations. There has been a general decline in urban background PM_{10} concentrations since 1992, but that - for the last few years - concentrations have hovered around the 18 µg/m^3 annual mean objective level.[340]

- PM_{10}: 2010 = 134.9 ktonnes/yr; 2015 = 135.4 ktonnes/yr; 2020 = 143.5 ktonnes/yr

[337] Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, http://www.official-documents.gov.uk/document/cm71/7169/7169_i.asp

[338] Defra http://archive.defra.gov.uk/evidence/statistics/environment/radioact/kf/rakf11.htm

[339] Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, /www.official-documents.gov.uk/document/cm71/7169/7169_i.asp

[340] http://www.scottishairquality.co.uk/documents/reports2/240090518_AQ_in__Scotland_2006_4F_JB_FF.pdf

Wales

There is a ‘clear improvement’ in the following Welsh air quality indicators: sulphur dioxide; nitrogen oxides; fine particulates; Non Methane Volatile Organic Compounds (NMVOC); carbon monoxide; and ammonia. There has also been an improvement in the area of natural and semi-natural habitat where deposition of acid exceeds critical loads.

The following indicators were rated ‘stable’ or they showed no clear trend:[341]

- number of days when air pollution is moderate or higher in rural zones and urban agglomerations;
- air concentrations of Heavy Metals; and,
- area of natural and semi-natural habitat where deposition of nitrogen compounds exceeds critical loads.

Northern Ireland

Recent years have seen a marked improvement in Northern Ireland's air quality. In particular, levels of pollutants associated with coal and oil combustion have reduced significantly over the past twenty years.

Air quality data indicates that there has been a general reduction in urban background PM_{10} concentrations since 1990.

Mean ozone concentrations in Northern Ireland do not appear to show any clear overall trend over the same period, although there is distinct year-to-year fluctuation. This is consistent with UK-wide observations, and the understanding that concentrations of this pollutant are strongly dependent on summer temperatures and weather conditions.

There are no clear trends in NO_2 concentration at the monitored sites. Areas which currently exceed the AQS Objective for annual mean NO_2 are therefore likely to continue to do so, in the absence of actions to reduce concentrations of this pollutant.[342]

[341] http://www.welshairquality.co.uk/documents//news/322100927_AQ_Wales_15_English_web.pdf

[342] Northern Ireland Department of Environment; Air Quality, http://www.airqualityni.co.uk/reports.php?n_action=trend

7.5.2 Sub-regional locations

Plymouth

In the South West Region air quality is generally improving. However, there is a trend of increasingly poor air quality locally due to increasing traffic emissions, transport growth and congestion.[343] Plymouth City Council aims to protect people and the environment from unsafe, unhealthy and polluted environments through ensuring that development causes no unacceptable impact on water or air quality.[344]

Fife

Air pollution is expected to increase as a result of industry growth, energy generation and road traffic growth.[345] Overall improved public transport should mitigate negative effects. Targets within the Fife Structure Plan 2006 are identified as being: to maintain and improve air quality; limit air pollution to levels that do not damage natural systems and to limit air emissions to comply with air quality standards.[346]

7.6 Assessment objective, guide questions and significance

The objective and guide questions related to air quality that have been used in the assessment of the effects of the SDP are set out in Table 7.1, together with reasons for their selection.

Table 7.1 Approach to assessing the effects of SDP on air quality

Objective/guide question	Reasoning
Objective: Minimise emissions of pollutant gases and particulates and enhance air quality	The SEA Directive requires that likely significant effects on air quality be taken into account in the Environmental Report.
Will the SDP proposals affect air quality?	Ambient Air Quality and Cleaner Air for Europe Directive aims to avoid the harmful effects on human health and environment from air pollution and includes objectives and targets for ambient air quality. This is transposed into UK law by Air Quality Standards.
Will the SDP proposals cause a change in radioactive emissions to air?	Radioactive emissions have the potential to negatively affect air quality and consequently health and environment.

[343] http://www.swenvo.org.uk/swren/work/
[344] http://www.plymouth.gov.uk/core_strategy_4web_11_chapter_11.pdf
[345] http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/dev-plan/FifeSP/FifeSEAreport
[346] http://www.fifedirect.org.uk/uploadfiles/publications/c64_PostAdoption-FinalisedPostAdoptionSEAStatement-January20101.pdf

Objective/guide question	Reasoning
Will the SDP proposals affect emissions of ozone-depleting substances?	Controls on emissions of substances that may deplete the ozone are included in the Ozone-Depleting Substances (Qualifications) Regulations.
Will the SDP proposals create a nuisance for people or wildlife (for example from dust or odours)?	Emissions to air may create dust or odours that have the potential to affect air quality or to be classed as a statutory nuisance (as under Environmental Protection Act 1990).

Table 7.2 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the air quality objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 7.2 Approach to determining the significance of effects on air quality

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option would significantly improve local air quality through a sustained reduction in concentrations of pollutants identified in the national air quality objectives. • Option leads to a cessation in radiological discharges to air. • Option has a strong and sustained positive effect on local communities and biodiversity adjacent to SDP sites and transport routes due to a significant reduction in air and odour pollution and particulate deposition.
+	Positive	• Option would lead to a minor improvement in local air quality from a reduction in concentrations of pollutants identified in the national air quality objectives. • Option would lead to a reduction in radiological discharges to air. • Option has a positive effect on local communities and biodiversity adjacent to SDP sites and transport routes due to a reduction in air and odour pollution and particulate deposition.
0	No (neutral effects)	• Option would not affect local air quality. • Option sees radiological discharges to air largely unchanged. • Option has no observable effects on local communities and biodiversity adjacent to SDP sites and transport routes.
-	Negative	• Option would result in a minor decrease in local air quality. • Option leads to a minor increase in radiation emissions to air. • Option has a negative effect on local communities and biodiversity adjacent to SDP sites and transport routes due to an increase in air and odour pollution and particulate deposition.

Effect	Description	Illustrative Guidance
--	Significant negative	• Option would cause a significant decrease in local air quality (e.g. leading to an exceedence of air Quality Objectives for designated pollutants and the designation of a new Air Quality Management Area). • Option leads to a significant increase in radiation emissions to air. • Option has a strong and sustained negative effect on local communities and biodiversity adjacent to SDP sites and transport routes due to significant increase in air and odour pollution and particulate deposition.
?	Uncertain	• From the level of information available the effects the impact that the option would have on this objective is uncertain.

7.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the air quality objective. **Table 7.3** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 7.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 7.4** below.

Table 7.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than

Category	Assumption Description
	‘greenfield’ sites, although it is recognised that ‘brownfield’ land can be important for conservation and biodiversity. • **‘Existing’, nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the ‘Dock Bottom Village’), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m^2. Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2. As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, ‘greenfield’ site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an ‘existing’ site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct (‘wet’) tow, or a ‘dry’ tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average).

Category	Assumption Description
	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine • It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since recycling a cleared submarine is little different to recycling a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be

Category	Assumption Description
	transported from the initial dismantling facility to the interim storage facility by sea, rail or road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Table 7.3** are considered in-turn below.

Stage I: Design and Develop Initial Submarine Dismantling Facilities

Air

Option 1: Develop a Greenfield Site for Initial Submarine Dismantling

Assessment of Effects:

The construction of initial dismantling and ancillary infrastructure on a greenfield site would result in the generation of dust, particularly from earthworks, soil stripping, storage and use of materials on site. This could have an effect on local air quality if unmanaged. Exhaust emissions from construction plant and diesel engine emissions from diesel generators used to supply non mains power may also contribute to increases in particulate matter and gaseous pollutants (particularly NO2 and carbon dioxide (CO2)).

However, the greatest potential effect on air quality during construction could be associated with the import of construction materials to the site and transport of any waste off site. Whilst movement of construction materials by sea is an option, it is still assumed that Option 1 represents a significant increase in traffic movements on the local road network. Exhaust emissions from construction traffic (e.g. from HGVs, personnel vehicles and deliveries) could lead to a decrease in local air quality, particularly as a result of increased levels of nitrogen oxides, nitrogen dioxide (NO2) and particulates.

It is assumed that ambient air quality of a greenfield site will be good and as a consequence, the emissions arising from construction traffic and construction activities will have a negative effect on this local air quality. Depending on the location and the proximity of local populations and other sensitive receptors (such as designated conservation sites), the effect may be considered to be significant. There is also the potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to air. However, in both circumstances, it is considered that the probability of such effects are low and the adoption of pollution control management procedures within a comprehensive CEMP will help mitigate this risk.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As the scale of construction would be reduced, it can therefore be assumed that levels of dust and emissions associated with construction activities and HGV movements will also be less and felt over a shorter duration relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing development over two periods may serve to keep emissions below threshold levels where they may adversely affect sensitive receptors.

Proposed Mitigation / Enhancements Measures:

- Where practicable, provision should be made for the transport of construction materials and construction wastes via rail or sea. All available transport options should be subject to environmental assessment to determine their effect.
- Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency.
- Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators. The potential for renewable energy generation (e.g. solar panels, dedicated wind turbines, ground source heat pumps or biomass boilers) to meet energy needs on site should be considered.
- Any risk of causing nuisance dust arising from construction activities should be reduced by making use of Best Available Technology and selecting suitable energy efficient, low emission equipment. This may include the following measures to suppress dust: the use of wet sweeping and cleaning methods; use of vehicle wheel wash facilities; the enforcement of low speed limits along temporary roads; paving of haul routes on site even if temporary to prevent re-suspension of dust emissions; sheeting vehicles transporting loose or potentially dusty material; delivering fine powder materials in enclosed tankers/silos; storage of dusty materials away from site boundaries; minimising the amount of excavated material held on site; sealing or re-vegetating completed earthworks as soon as reasonably practicable; and the use of design/pre-fabrication to reduce the need for grinding, sawing and cutting.

Stage I: Design and Develop Initial Submarine Dismantling Facilities Air	
• The use of dense vegetation, screens and barriers to help reduce the effects of particulate matter should be considered, as should the orientation with respect to locally prevailing winds. • Zoning of construction site so that increased dust is kept to a minimum.	
Summary: Option 1 has been assessed as having a negative effect in relation to this objective due to the significant construction required for both development of initial dismantling facilities and all ancillary uses/infrastructure. Development on greenfield land is expected to require a higher level of construction and associated vehicular movements due to an assumed lack of existing infrastructure and buildings. For RC and RPV options construction of the size reduction facility would be delayed. This may reduce emissions associated with construction activities and HGV movements in the short term relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling to packaged waste.	-

Option 2: Develop Brownfield Site for Initial Submarine Dismantling

Assessment of Effects:

The construction of the initial dismantling facilities and ancillary infrastructure on a brownfield site would result in the generation of dust, particularly from earthworks, soil stripping, storage and use of materials on site although this is expected to be less than in Option 1 due to the assumed reduced levels of construction required through existing infrastructure from previous uses of the site being put to good use where possible. Nonetheless this could have an effect on local air quality if unmanaged. Exhaust emissions from construction plant and diesel engine emissions from diesel generators used to supply non-mains power may also contribute to increases in particulate matter and gaseous pollutants (particularly NO2 and carbon dioxide (CO2)) although these are anticipated to be reduced to that identified within Option 1.

However, the greatest potential effect on air quality during construction could be associated with the import of construction materials to the site and transport of any waste off site. Whilst movement of construction materials by sea is an option, it is still assumed that Option 2 represents an increase in traffic movements on the local road network although this is expected to have already been developed due to the development of the previous site. Exhaust emissions from construction traffic (e.g. from HGVs, personnel vehicles and deliveries) could lead to a decrease in local air quality, particularly as a result of increased levels of nitrogen oxides, nitrogen dioxide (NO2) and particulates.

It is assumed that ambient air quality of a brownfield site will be fair to good and as a consequence, the emissions arising from construction traffic and construction activities will have a negative effect on this local air quality albeit less that that identified within Option1. Depending on the location and the proximity of local populations and other sensitive receptors (such as designated conservation sites), the effect maybe considered to be significant. There is also the potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to air. However, in both circumstances, it is considered that the probability of such effects are low and the adoption of pollution control management procedures within a comprehensive CEMP will help mitigate this risk.

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV options, specialist facilities needed to package ILW will not be required until after interim storage. As the scale of construction would be reduced, it can therefore be assumed that levels of dust and emissions associated with construction activities and HGV movements will also be less and felt over a shorter duration relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing development over two periods may serve to keep emissions below threshold levels where they may adversely affect sensitive receptors.

Stage I: Design and Develop Initial Submarine Dismantling Facilities Air	
Proposed Mitigation / Enhancements Measures: The following additional measures to those under Option 1 have been identified: • Make best use of existing buildings and infrastructure. • Seek to reuse and recycle demolition materials in the construction of the facility and ancillary uses/infrastructure.	
Summary: Option 2 has been assessed as having a negative effect in relation to this objective although the scale and likelihood of these effects is considered to be less than that of Option 1. This is primarily due to the fact that anticipated effects associated with construction and/or demolition required for development will be reduced as the option makes good use of existing site infrastructure. The volume of transport movements although again reduced in comparison to that identified within Option1 will also bring about a negative effect. For RC and RPV options construction of the size reduction facility would be delayed. This may reduce emissions associated with construction activities and HGV movements in the short term relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling to packaged waste.	**-**
Option 3: Develop an Existing Licensed/Authorised Site for Initial Submarine Dismantling	
Assessment of Effects: The construction of the SDP facilities and ancillary infrastructure on an existing Licensed/Authorised site would result in the generation of dust, particularly from earthworks, soil stripping, storage and use of materials on site although this is expected to be less than in Options 1 and 2 due to the assumed further reduced levels of construction required through existing infrastructure of the licensed authorised site being put to good use where possible. None the less this could have an effect on local air quality if unmanaged. Exhaust emissions from construction plant and diesel engine emissions from diesel generators used to supply non-mains power may also contribute to increases in particulate matter and gaseous pollutants (particularly NO2 and carbon dioxide (CO2)) although these are anticipated to be reduced to that identified within Option 1 and 2. However, the greatest potential effect on air quality during construction could be associated with the import of construction materials to the site and transport of any waste off site. Whilst movement of construction materials by sea is an option, it is still assumed that Option 3 represents an increase in traffic movements on the local road network although this is expected to be further reduced in scale and likelihood than identified within the previous options. Exhaust emissions from construction traffic (e.g. from HGVs, personnel vehicles and deliveries) could lead to a decrease in local air quality, particularly as a result of increased levels of nitrogen oxides, nitrogen dioxide (NO2) and particulates. It is assumed that ambient air quality of an existing Licensed/Authorised site will be similar to that of any port facility and as a consequence, the emissions arising from construction traffic and construction activities will have a negative effect on this local air quality albeit less that that identified within Option 1 and potentially 2. Depending on the location and the proximity of local populations and other sensitive receptors (such as designated conservation sites), the effect maybe considered to be significant, specifically as it is assumed that there will be existing activities taking place on the proposed site therefore affecting existing site tenants and businesses. There is also the potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to air. However, in both circumstances, it is considered that the probability of such effects are low and the adoption of pollution control management procedures within a comprehensive CEMP will help mitigate this risk. **Technical Options:** All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, where and when some site components are installed will differ across the technical options, reflecting the scope of initial dismantling operations. For the RC and RPV	

Stage I: Design and Develop Initial Submarine Dismantling Facilities Air	
options, specialist facilities needed to package ILW will not be required until after interim storage. As the scale of construction would be reduced, it can therefore be assumed that levels of dust and emissions associated with construction activities and HGV movements will also be less and felt over a shorter duration relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing development over two periods may serve to keep emissions below threshold levels where they may adversely affect sensitive receptors. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 2.	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective although the scale and likelihood of these effects is considered to be less than that of Option 1 and Option 2. This is primarily due to the fact that anticipated effects associated with construction and/or demolition required for development will be reduced as the option makes best use of existing site infrastructure/facilities. The volume of transport movements although again reduced in comparison to that identified within Option 1 will also bring about a negative effect. For RC and RPV options construction of the size reduction facility would be delayed. This may reduce emissions associated with construction activities and HGV movements in the short term relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling to packaged waste.	-

Stage II : Design and Develop the Interim ILW Storage Facility Air	
Option 1: Develop a Greenfield Site for ILW Storage	
Assessment of Effects: Given the generic nature of the construction proposals for the interim storage facility, it is assumed that the potential effects associated with this objective will be largely similar as for Stage 1. The construction of interim storage facilities and ancillary infrastructure on a greenfield site would result in the generation of dust, particularly from earthworks, soil stripping, storage and use of materials on site. This could have an effect on local air quality if unmanaged. Exhaust emissions from construction plant and diesel engine emissions from diesel generators used to supply non mains power may also contribute to increases in particulate matter and gaseous pollutants (particularly NO2 and carbon dioxide (CO2)). However, the greatest potential effect on air quality during construction could be associated with the emissions from vehicle movements to and from the site (bringing in construction materials and removing waste). Whilst movement of construction materials by sea is an option, it is still assumed that Option 1 represents a significant increase in traffic movements on the local road network. Exhaust emissions from construction traffic (e.g. from HGVs, personnel vehicles and deliveries) could lead to a decrease in local air quality, particularly as a result of increased levels of nitrogen oxides, nitrogen dioxide (NO2) and particulates. It is assumed that ambient air quality of a greenfield site will be good and as a consequence, the emissions arising from construction traffic and construction activities will have a negative effect on this local air quality. Depending on the location and the proximity of local populations and other sensitive receptors (such as designated conservation sites), the effect maybe considered to be significant. There is also the potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to air. **Technical Options** The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows: • RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas). • RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above. • Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure. The scale and potential significance of effects associated with construction is most likely to be greatest for the development a RC storage facility given the increased footprint and land-take of greenfield land relative to RPV and Packaged Waste options and the emissions from vehicle movements to and from the site (bringing in construction materials and removing waste). Furthermore, due to the need to transport RCs by sea, RC storage facilities would require the construction of a dock thus increasing the potential for further emissions to air. Similar effects may also be generated under the RPV option should RPVs be transported by sea. **Proposed Mitigation / Enhancements Measures:** Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.	
Summary: Option 1 has been assessed as having a negative effect in relation to this objective due to the range of emissions arising from the construction required for both development of an interim storage facility and all ancillary uses/infrastructure. The greatest potential effect on air quality during construction would be associated with the emissions from construction vehicle movements to and from the site. The potential effects of the emissions (dust, particulates, NOX) on air quality are more likely to be observable, as the ambient air	**-**

Stage II : Design and Develop the Interim ILW Storage Facility Air	
quality of the greenfield site is assumed to be good. There is potential that development for storage of RCs could result in a reduced level of air quality given the increased scale of construction and vehicular movements relative to RPV or Packaged Waste options. However, development of this scale is not expected to create significant negative effects related to air quality.	

Option 2: Develop a Brownfield Site for ILW Storage

Assessment of Effects:

The construction of an interim storage facility on a brownfield site would result in a range of emissions similar to those described in Option 1, namely emissions from demolition and construction activities on site as well as emissions from construction vehicle movements. However, it is generally expected that the scale of construction on a brownfield site will be less than for Option 1 as it is assumed that most of the infrastructure will not be required. As a result, the effects are considered to be of a smaller magnitude.

It is assumed that ambient air quality of a brownfield site will be fair to good and as a consequence, the emissions arising from construction traffic and construction activities will have a negative effect on this local air quality albeit less that that identified within Option 1.

Depending on the location and the proximity of local populations and other sensitive receptors (such as designated conservation sites), the effect maybe considered to be locally significant.

There is also the potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to air.

Technical Options:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

The scale and potential significance of effects associated with construction is most likely to be greatest for the development a RC storage facility given the increased footprint relative to RPV and Packaged Waste options and the emissions from vehicle movements to and from the site (bringing in construction materials and removing waste).

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.

Summary: Option 2 has been assessed as having a potential negative effect in relation to this objective due to the range of emissions to air arising from construction and vehicle movements. However, the magnitude of these effects is considered to be less than that of Option 1 as the scale of construction is assumed to be less. The ambient air quality of the brownfield site is assumed to be generally good and as such, the potential effects of the emissions (dust, particulates, NOX) on air quality are still likely to be observable. As the brownfield site is assumed to be in a semi-urban setting, the potential to be closer to sensitive receptors in the local population is higher than that for Option 1.	-

Stage II : Design and Develop the Interim ILW Storage Facility Air	
There is potential that development for storage of RCs could result in a reduced level of air quality given the increased scale of construction and vehicular movements relative to RPV or Packaged Waste options. However, development of this scale is not expected to create significant negative effects related to air quality.	

Option 3: Develop an Existing Licensed/Authorised Site for ILW Storage

Assessment of Effects:

The construction of the SDP facilities and ancillary infrastructure on an existing Licensed/Authorised site would result in a range of emissions similar to those described in Option 1, namely emissions from demolition and construction activities on site as well as emissions from construction vehicle movements. However, it is generally expected that the scale of construction on an existing Licensed/Authorised site will be less than for Options 1 and 2 as it is assumed that most of the infrastructure and ancillary facilities will already be present. As a result, the effects are considered to be of a smaller magnitude.

It is assumed that ambient air quality of an existing Licensed/Authorised site will be similar to that of any port facility and likely to be generally good although there may be specific exceedences of statutory targets for specific pollutants on occasion. The emissions arising from construction traffic and construction activities could have a negative effect on this local air quality albeit less that that identified within Option 1 and potentially Option 2.

As the existing Licensed/Authorised site is assumed to be in an urban setting, the potential to be closer to sensitive receptors in the local population is higher than that for Option 1 (and potentially Option 2) specifically as it is assumed that there will be construction activities taking place on an occupied site therefore affecting existing site tenants and businesses. There is also the potential for negative effects on this objective to be felt as a result of accidental discharges of construction-related materials to air.

Technical Options:

The scale of effects on this objective for interim ILW storage is strongly dependent on the technical options implemented, since each produces ILW with a different storage footprint. The indicative surface area requirements for storage facilities are as follows:

- RC storage: 11,600m2 of space would be needed to house the 27 sealed RCs plus supporting infrastructure (e.g. receipt/dispatch facilities, inspection/maintenance facilities and office/admin areas).
- RPV storage: 801m2 of space would be needed to house the 27 boxed RPVs plus supporting infrastructure, as above.
- Packaged ILW storage: 1,005m2 of space would be needed to house the estimated 162x3m3 ILW containers (based on an average of 6 per submarine), plus supporting infrastructure.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar.

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1.

Summary:	
Option 3 has been assessed as having a potential negative effect in relation to this objective. This is primarily due to the anticipated effects associated with construction and/or demolition required for development of an interim storage facility and the emissions from the movement of construction materials and personnel. However, the magnitude of these effects is considered to be less than that of Options 1 and 2 as the scale of construction is assumed to be less. The ambient air quality of an existing Licensed/Authorised site is assumed to be generally good and as such, the potential effects of the emissions (dust, particulates, NOX) on air quality are still likely to be observable. As the site is assumed to be in an urban setting, the potential to be close to sensitive receptors in the local population is higher than that for Option 1 (and potentially Option 2).	-

Stage II : Design and Develop the Interim ILW Storage Facility Air	
There is potential that development for storage of RCs could result in a reduced level of air quality given the increased scale of construction and vehicular movements relative to RPV or Packaged Waste options. However, development of this scale is not expected to create significant negative effects related to air quality.	

Stage III: Dock Submarines and Remove the Radioactive Materials Air	
Option 1: Reactor Compartment Separation	
Assessment of Effects: Through the anticipated transportation of the submarine by sea to the initial dismantling facility it is assumed that, regardless of the mode of ocean going transport used (wet tow, dry tow or Heavy Lift Vessel) there will be emissions to air from the transport vehicle/vessel. However, due to the associated uncertainties (specific vehicles used, distances involved), the level of actual emissions cannot be established at this stage although as only one submarine will be processed per year, it can be reasonably assumed that emissions would be insignificant. Prior to movement, the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine itself during transport. However, in exceptional circumstances where an accident occurred, e.g. submarine grounding, a collision leading to partial or complete sinking or a major fire leading to pollutant emissions, there could be significant effects on local air quality; although the likelihood of any such incident is considered to be exceptionally low. Option 1 will require the complete removal of the RC intact from each submarine hull. As the ILW and LLW will remain within the RC and not be processed within this option, it is considered to have the least potential effect in relation to radiological discharges to air over the medium term. Nevertheless, separation of the RC is likely to result in the generation of dust, particularly from cutting and mechanical separation of the RC from the submarine structure and hull. This activity is expected to take place in an open environment with limited opportunities or potential for shielding and thus any reduction in potential air emissions to the receiving environment. This could have an effect on local air quality although it is expected to be minimal. Exhaust emissions from plant machinery, diesel generators and HGV movements related to the transportation of general waste may also contribute increases in particulate matter and gaseous pollutants (particularly NOx and carbon dioxide (CO_2) although again these are expected to be minimal. The RC will be dismantled to packaged waste at a later stage creating further potential for radiological and non-radiological emissions to air in the longer term (see Stage 6 of this assessment). However, there is potential for development of alternative techniques during the delay which could reduce the potential for increased emissions to air although this is very uncertain. In addition, the delay increases the radioactive decay. **Proposed Mitigation / Enhancements Measures:** • All available transport options should be subject to environmental assessment to determine their effect. • Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency. • Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators. The potential for renewable energy generation (e.g. solar panels, dedicated wind turbines, ground source heat pumps or biomass boilers) to meet energy needs on site should be considered. • Any risk of causing nuisance dust arising from dismantling activities should be reduced by making use of Best Available Technology and selecting suitable energy efficient, low emission equipment. This may include the following measures to suppress dust: the use of wet sweeping and cleaning methods; use of vehicle wheel wash facilities; the enforcement of low speed limits along temporary roads; paving of haul routes on site even if temporary to prevent re-suspension of dust emissions; sheeting vehicles transporting loose or potentially dusty material; delivering fine powder materials in enclosed tankers/silos; storage of dusty materials away from site boundaries. • Zoning of dismantling site so that increased dust is kept to a minimum.	
Summary: Transport-related emissions from moving the submarines to the initial dismantling site(s) would depend on how they are moved, and the distances involved. However, it is expected that only one submarine will be processed per year, so air emissions would be insignificant. Separation of the RC is likely to result in the generation of dust, particularly from cutting and mechanical separation of the RC from the submarine structure and hull. This activity is expected to take place in an open environment with limited opportunities	**-**

Stage III: Dock Submarines and Remove the Radioactive Materials Air	
or potential for shielding and thus any reduction in potential air emissions to the receiving environment. This could have an effect on local air quality although it is expected to be minor. As under this option the RC is stored intact it is considered that there is less potential for radiological discharges to air in the medium term as the ILW and LLW will remain within the RC and not be processed until a later stage (Stage 6).	
Option 2: Reactor Pressure Vessel Removal	
Assessment of Effects: The scope of potential effects (and uncertainties) on air quality from submarine movements are similar to those outlined for Option 1. Under this option, the RPV will be removed from the structure and hull of the submarine for interim storage with some LLW arising during the removal process. The removal of the RPV is likely to result in the generation of dust and air emissions, particularly from cutting and mechanical removal of the RPV from the submarine hull. This could have an effect on local air quality however it is expected to be further reduced than that identified within Option 1 as although there is a greatest level of intrusion, the majority of activities with potential to create emissions to air will be undertaken within the containment of the submarine hull thus reducing the potential for non-radiological emissions. The RPV option is considered to carry a marginally higher theoretical risk of radiological discharge during initial dismantling than the RC option, as it requires intrusive activities into the RC. However, at this stage and similar to the RC option, the RPV option is considered to have a lower risk of unplanned radiological discharge than that associated with the Packaged Waste option, as the quantities of any irradiated materials at this point are small (and largely contained within the RPV) and the risks of such unplanned discharge are considered very small. Nonetheless, it is assumed that the radioactive discharges from operation will be minimal across all options due to the requirements that any discharges will be 'as low as reasonable practicable' (ALARP) and the requirement to use BAT within the dismantling processes. For example, a high efficiency, filtered extraction ventilation system for RPV removal work should prevent discharges of dust and particulates. However, if the safeguards were to fail there could be potentially a significant negative impact on air quality. The magnitude of such effect would depend on the quality of air in receiving areas and proximity to sensitive sites. Exhaust emissions from plant machinery, diesel generators and HGV movements related to the transportation of general waste and LLW may also contribute increases in particulate matter and gaseous pollutants (particularly NOx and carbon dioxide (CO_2) although again these are expected to be minimal they will be further increased that that identified within Option 1. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Transport-related emissions from moving the submarines to the initial dismantling site(s) would depend on how they are moved, and the distances involved. However, it is expected that only one submarine will be processed per year, so air emissions would be insignificant. Under this option, the RPV will be removed from the hull for storage with some LLW arising in the deplanting process. The deplanting of the RPV is likely to result in the generation of dust, particularly from cutting and mechanical removal of the RPV from the submarine hull. This could have a negative effect on local air quality. However, the scale of these activities will be less than for Option 1 and as such, the potential for non-radiological emissions to air will also be lower. Option 2 does involve some intrusive activities within the RC leading to the removal of the RPV and the creation of some LLW. For this reason it is expected that Option 2 will have more potential for radiological emissions than Option 1. However, this risk will have to be kept as low as reasonably practicable by law, in order for work to proceed.	-
Option 3: Reactor Pressure Vessel Removal and Size Reduction for Storage as Packaged Waste	

Stage III: Dock Submarines and Remove the Radioactive Materials Air	
Assessment of Effects: The scope of potential effects (and uncertainties) on air quality from submarine movements are similar to those outlined for Option 1. Option 3 requires full dismantling of the RC to packaged waste. This is likely to result in the generation of dust and particulates, particularly from the initial removal of the RPV and subsequent cutting up of steels. It is assumed that all such activities will be conducted within appropriate environmental containment measures; however, the range of activities (and individual processes) indicates that there is greater potential for radiological and non-radiological discharges to occur. Nonetheless, it is assumed that the radioactive discharges from operation will be minimal across all options due to the requirements that any discharges will be 'as low as reasonable practicable' (ALARP) and the requirement to use BAT within the dismantling processes. For example, a high efficiency, filtered extraction ventilation system for RPV removal work should prevent discharges of dust and particulates. However, if the safeguards were to fail there could be potentially a significant negative impact on air quality. The magnitude of such effect would depend on the quality of air in receiving areas and proximity to sensitive sites. Exhaust emissions from plant machinery, diesel generators and HGV movements related to the transportation of general waste and LLW may also contribute increases in particulate matter and gaseous pollutants (particularly NO2 and carbon dioxide (CO2) although again these are expected to be minimal they will be further increased that that identified within Option 1 and 2 in the medium term. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Transport-related emissions from moving the submarines to the initial dismantling site(s) would depend on how they are moved, and the distances involved. However, it is expected that only one submarine will be processed per year, so air emissions would be insignificant. This option is unlike Options 1 and 2, as full dismantling of the RPV to packaged waste will take place in a single stage, prior to interim storage and eventual transfer to the proposed GDF. The potential for an accidental release of pollutants and radioactive materials into the environment is in theory, therefore, the highest of the three options, as the RPV itself would be taken apart and packaged 'up front.' However, this risk would have to remain very low in order for work to proceed.	**-**

Stage IV: Dismantle the Residual Submarine Hulls, and Process Wastes Air	
All Options	
Assessment of Effects: Transportation of the submarine hulls by sea from the initial dismantling facility to the ship recycling facility, regardless of the mode of transport used (barge/semi submersible ship, towing or reconnection of the hulls to produce a watertight unit capable of floatation for movement for RC storage), will generate emissions to air from the transport vehicle. However, due to the associated uncertainties (specific vehicles used, distances involved), the level of actual emissions cannot be established at this stage although as only one submarine will be processed per year, it can be reasonably assumed that emissions would be insignificant. There is a risk for accidental discharge of hazardous and other gaseous substances to air, such as asbestos and refrigerant gases, during submarine hull movement that could have a negative effect on air quality. However, it is considered that any such risk is remote, as submarine hulls will have undergone preparation for safe transportation. In addition, submarine hull movement could lead to discharges to air from a collision event, grounding or a major fire event. The likelihood of any such event occurring is very small and it is also considered that the quantities of hazardous gases remaining on the submarine sections will be negligible, as they will be removed during the de-pollution process prior to transportation. Cutting techniques used during operational activities are likely to result in the generation of dust. There is also the potential for dust and particulates containing contaminants to be generated during the recycling process, such as chromate paints during shot blasting or asbestos during removal of insulating materials. Environmental containment measures will be used to ensure that any dust and particulate matter associated with cutting up and the removal of these materials will not have an adverse effect on local air quality. Exhaust emissions from plant machinery, diesel generators and HGV movements related to the transportation of general waste will release particulate matter and gaseous pollutants (particularly NOx and carbon dioxide (CO_2) may affect local air quality. The scale of HGV movements of recyclate is estimated to be in the order 200 – 300 per annum based on anticipated volumes of recyclate generated. However, these pollutants are expected to be of a similar level to those already released at the ship recycling facility, as the work will be of a similar nature to that already carried out on site. At the initial dismantling facility it is expected that these releases will be additional to the current baseline, however, they are expected to be minimal and of a scale unlikely to affect local air quality. **Proposed Mitigation / Enhancements Measures:** • Any risk of causing nuisance dust arising from activities should be reduced by making use of Best Available Technology and selecting suitable energy efficient, low emission equipment. • Zoning of dismantling site so that increased dust is kept to a minimum • All available transport options should be subject to environmental assessment to determine their effect. • Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency. • Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators. The potential for renewable energy generation (e.g. solar panels, dedicated wind turbines, ground source heat pumps or biomass boilers) to meet energy needs on site should be considered.	
Summary: Transport-related emissions from moving the submarine hulls would depend on how they are moved, and the distances involved. However, it is expected that only one submarine will be processed per year, so air emissions would be insignificant. Risks of accidental discharges to air during movement of submarine hulls is considered to be low as the hull will be prepared for safe transportation and most of the gas stores should be removed prior to transportation during the depollution process. Emissions of dust, particulates and gases (including NOx, CO_2) is expected to be minimal and of a level unlikely to affect local	**0**

Stage IV: Dismantle the Residual Submarine Hulls, and Process Wastes Air	
air quality.	

Stage V: Transport RC/RPV/ILW to Interim Storage **Air**	
Option 1: Reactor Compartment Transport to Interim Storage	
Assessment of Effects: Due to the scale and weight of RCs, the movement of RC from the initial dismantling facility to the interim storage facility will be by sea via barge or heavy lift ship. Movement by sea will involve a number of specific activities that could generate dust, particulates and emissions to air. As part of the preparation for transport, it is assumed that cut ends of the RC will be secured and covered with steel plate. Any cutting may generate dust; however, it would be anticipated that this would be contained within the dock. The RC will then be lifted and loaded to a sea barge/ship, transported to the interim storage facility and subsequently unloaded. It is therefore expected that there will be exhaust emissions created from the barge/ship and any vehicles involved in the heavy lift. The total emissions will depend upon the distance to be travelled between the initial dismantling site and storage site, which as the locations are not known is currently uncertain. However, as it is expected that only one submarine will be processed per annum it is assumed that the emissions to air from this transport will be minimal. As the RC will have been prepared for storage prior to transportation to the interim storage facility it is assumed that the potential for radiological discharges will be limited to accidental discharges arising from unplanned events (such as a fire). Approvals for transportation will only be given once the regulator is satisfied that the possibility for incidents and accidents has been minimised and that the radiological content can be effectively contained if that were to occur. Maintenance of the RC once in storage may generate some very limited emissions to air although these are expected to be contained within the interim storage facility. There remains a risk of an unplanned incident such as a major fire at the interim storage facility resulting in the release of radiological contaminants. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. If safeguards were to fail then there could be a significantly negative impact on air quality from the emission of pollutants during any such fire. **Proposed Mitigation / Enhancements Measures:** • Emergency response plan to address any potential unplanned events	
Summary: It is expected that transportation of the RC to interim storage will have limited or no effect on air quality. The only likely emissions to air during this stage of the SDP process are expected to be as a result of the actual transportation movements themselves although there may be limited emissions associated with preparation of RCs for transport and maintenance (once in storage). As the RC can only be transported any distance further than the initial dismantling site by sea due to its size and scale, emissions from marine diesel engines and possible diesel generators used by heavy lift vehicles are the only expected potential causes of emissions to air.	**0**
Option 2: Reactor Pressure Vessel Transport to Interim Storage	
Assessment of Effects The movement of RPV from the initial dismantling facility to the interim storage facility is potentially possible by sea, rail or road. Prior to the transportation of the RPV it is not possible to determine whether there is potential for emissions to air as the RPV is to be secured within a purpose built container for transportation and storage. As this container has yet to be developed it is unclear as to what this will require. It is therefore expected that through transportation and vehicular movements of the RPV, there will be emissions to air. If the movement of the RPV was by sea, these emissions would be from towing vehicle or vessel. If the RPV is moved by rail, there would be emissions from the diesel	

Stage V: Transport RC/RPV/ILW to Interim Storage Air	
engines used to power the train. If by road, the emissions would be from a heavy lift vehicle. There is also likely to be emissions to air from supporting vehicles associated with each mode of transport. Given the options for transportation, the total emissions will likely depend upon the distance to be travelled between the initial dismantling site and interim storage site as well as the transport option considered most appropriate, which as the locations are not known is currently uncertain. However, as it is expected that only one submarine will be processed per annum it is assumed that the emissions to air from all transport methods will be minimal. As the RPV will have been prepared for storage prior to transportation it is assumed that the potential for radiological discharges will be very limited to accidental discharges arising from unplanned events (such as a fire). Approvals for transportation will only be given once the regulator is satisfied that the possibility for incidents and accidents has been minimised and that the radiological content can be effectively contained if that were to occur. Maintenance of the RPV once in storage may generate some very limited emissions to air although these are expected to be contained within the interim storage facility. There remains a risk of an unplanned incident such as a major fire at the interim storage facility resulting in the release of radiological contaminants. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. If safeguards were to fail then there could be a significantly negative impact on air quality from the emission of pollutants during any such fire. **Proposed Mitigation / Enhancements Measures** • Emergency response plan to address any potential unplanned events	
Summary: It is expected that transportation of the RPV to interim storage will have limited or no effect on air quality. The only likely emissions to air during this stage of the SDP process are expected to be as a result of the actual transportation movements themselves via vehicular activity although there may be limited emissions associated with preparation of RPVs for transport and maintenance (once in storage). However, it is expected that there is likely to be only one RPV movement per year and therefore potential emissions to air will be small.	**0**
Option 3: Packaged Waste Transport to Interim Storage	
Assessment of Effects: Packaged waste could be transported from the initial dismantling facility to the interim storage facility by either rail or road. However it is considered that there will be no emissions to air during the preparation of packaged waste for transportation to the interim storage facility. It is therefore expected that transportation of the packaged waste will result in emissions to air. If the packaged waste is moved by rail, there would be emissions from the diesel engines used to power the train. If by road, the emissions would be from a heavy lift vehicle. There is also likely to be emissions to air from supporting vehicles associated with each mode of transport. Given the options for transportation, the total emissions will likely depend further upon the distance to be travelled between the initial dismantling site and interim storage site as well as the transport option considered most appropriate, which as the locations are not known is currently uncertain. However, as it is expected that only one submarine will be processed per annum it is assumed that the emissions to air from all transport methods will be minimal. Given that the packaged waste will largely comprise of cut up steel, immobilised within a grout, any radiological discharge associated with the movement of each container will be exceptionally low. No liquid ILW will be transported. It is therefore considered unlikely that there will be any planned or unplanned radiological discharges during transport. In addition, approvals for transportation will only be given once the regulator is satisfied that the possibility for incidents and accidents has been minimised and that the radiological content can be effectively contained if that were to occur. Any maintenance of the packaged waste once in storage may generate some very limited emissions to air although these are expected to be contained within the interim storage facility. There remains a risk of an unplanned incident such as a major fire at the storage facility resulting in	

Stage V: Transport RC/RPV/ILW to Interim Storage Air	
the release of radiological contaminants. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. If safeguards were to fail then there could be a significantly negative impact on water quality from the deposition of contaminants from any such fire. The significance of such an effect will depend upon location, proximity to surface or standing water and volumes discharged. **Proposed Mitigation / Enhancements Measures** • Emergency response plan to address any potential unplanned events	
Summary: It is expected that transportation of the packaged waste to an interim storage facility will have a limited or no effect on air quality. The only likely emissions to air during this stage of the SDP process are expected to be as a result of the actual transportation movements themselves via vehicular activity although there may be limited emissions associated with maintenance (once packaged waste is in storage). However, it is expected the movement of packaged waste will be infrequent and although it is uncertain as to the distance to be travelled to the interim storage facility, emissions to air will be very low.	**0**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Air
Option 1: Size Reduce the Reactor Compartment and Transfer Packaged Waste to the Proposed GDF

Assessment of Effects:

Depending on where the RCs are stored and where they are to be finally dismantled, there may be a requirement to transport RCs. It is expected due to the size and weight of RC that this will only occur by sea and by barge or heavy lift vessel. As RCs will be sealed (in accordance with the Transport Regulations), it is not expected that there will be any discharge of radiological contaminants. It is also assumed that RCs would be passively safe (i.e. all liquids and potentially mobile radioactive materials would be removed or immobilised) and as such it is not expected that there will be any risk of accidental discharge of radiological contaminants during transportation.

Movement by sea will involve a number of specific activities that could generate dust, particulates and emissions to air. The RC will be lifted and loaded onto a sea barge/heavy lift vessel, transported and unloaded at the size reduction facility. It is therefore expected that there will be exhaust emissions created from the barge/vessel and any vehicles involved in the heavy lift. The total emissions will depend upon the distance to be travelled, which as the locations are not known is currently uncertain. However, as it is expected that only one submarine will be processed per annum it is assumed that the emissions to air from this transport will be minimal.

This option will require dismantling of the RC to packaged waste. This is likely to result in the generation of dust and particulates, particularly from the initial removal of the RPV and subsequent cutting up of steels. It is assumed that all such activities will be conducted within appropriate environmental containment measures; however, the range of activities (and individual processes) indicates that there is greater potential for radiological and non-radiological discharges to occur relative to Options 2 and 3. Moreover, much of initial activity will be outside the size reduction facility, where environmental containment will prove more challenging and there is potential for accidental release of pollutants and radioactive material during RPV removal. Nonetheless, it is assumed that the radioactive discharges from operation will be minimal across all options due to the requirements that any discharges will be 'as low as reasonable practicable' (ALARP) and the requirement to use BAT within the dismantling processes. For example, a high efficiency, filtered extraction ventilation system for RPV removal work should prevent discharges of dust and particulates. However, if the safeguards were to fail there could be potentially a significant negative impact on air quality. The magnitude of such effect would depend on the quality of air in receiving areas and proximity to sensitive sites.

As set out under the assessment of this option for Stage 3, the delay in works will result in a reduction of the total radioactivity that could potentially be discharged to the environment during normal operations. In addition, delay (given that it will be at least 30 years before cut up begins) may provide sufficient time to enable new cut up techniques to be developed and applied (in accordance with the BAT), which should ensure that future operational discharges of both radiological emissions and non-radiological emissions will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain.

Exhaust emissions from plant machinery, diesel generators and HGV movements related to the transportation of general waste may also contribute increases in particulate matter and gaseous pollutants (particularly NOx and carbon dioxide (CO2) although again these are expected to be minimal.

As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated risks on adjacent sensitive receptors, there is only a remote likelihood of any accidental discharges during transport. Further, the route of the transport is not known however exhaust emissions from HGV movements related to the transportation of ILW and LLW may also contribute increases in particulate matter and gaseous pollutants (particularly NOx and carbon dioxide (CO2) although again these are expected to be minimal. Therefore it is determined that transportation of packaged waste is not expected to pose any effect to air, under normal operating circumstances.

Once the RPV has been removed the remaining RC casing which is expected to be non radioactive will be cut up and size reduced on site. All items removed or size reduced from the RC casing will be monitored, characterised and transferred to a suitable waste processing facility for recycling or disposal as appropriate. However, it is uncertain as to where the cut up and size reduction of the RC casing will take place within the SDP site and subsequently the level of shielding that will be provided. Nonetheless the generation of any emissions from this activity is unlikely to be greater than that already experienced from other activities within the SDP site and consequently unlikely to have an adverse effect when compared to the current baseline.

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF Air	
Proposed Mitigation / Enhancements Measures: • Any local AQMAs would need to be identified and any adverse effects on air quality within these areas identified and avoided. • All available transport options should be subject to environmental assessment to determine their effect. • Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency.	
Summary: Option 1 has been assessed as having a negative effect in relation to this objective. Under this option the RC has been stored intact and will therefore require full dismantling to packaged waste. It is therefore considered that there is greater potential for discharges to air as there is expected to be an increase in intrusive activities causing more likelihood of creating radioactive and non radioactive emissions to air. However, although it is expected that there will be potential for an increase in emissions to air, levels are not anticipated to be significant and it is assumed that the radioactive discharges from operation will be minimal. The route of the transport of packaged waste to the proposed GDF is not known however exhaust emissions from HGV movements related to the transportation of ILW and LLW also contribute increases in particulate matter and gaseous pollutants (particularly NOx and carbon dioxide (CO_2) although these are expected to be minimal. Therefore it is determined that transportation of packaged waste is not expected to pose any effect to air, under normal operating circumstances.	**-**
Option 2: Size Reduce the Reactor Pressure Vessel and Transfer Packaged Waste to the Proposed GDF	
Assessment of Effects: The potential effects associated with this option are similar to the range of effects described in Option 1. Depending on where the RPVs are stored and where they are to be finally dismantled, there may be a requirement to transport RPVs. RPV is expected to be transported from the interim storage facility to the size reduction facility by rail, road or sea and although there will be some related emissions, in view of the anticipated frequency of movements, levels are expected to be very low It is assumed that dismantling of the RPV to packaged waste will take place within the shielded interior of the size reduction facility where there will be containment of any emissions arising from cutting and mechanical size reduction. There is the potential for accidental release of pollutants and radioactive material during size reduction, including accidental release of pollutants mobilised in a fire. Whilst it is considered unlikely that there will be any significant impact from accidental discharges to air, if the safeguards were to fail there would be potentially a significant negative impact on air quality. The magnitude of such effect would depend on the quality of air in receiving areas and proximity to sensitive sites. Exhaust emissions from plant machinery, diesel generators and HGV movements related to the transportation of general waste and LLW may also contribute increases in particulate matter and gaseous pollutants (particularly NOx and carbon dioxide (CO_2) although again these are expected to be minimal they will be further increased that that identified within Option 1. The effects from the movement of packaged waste will be the same as Option 1. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a *potentially* negative effect in relation to this objective. Under this option the RPV will have already been removed and retained in interim storage. On removal from interim storage, dismantling to packaged waste will be required which is expected to increase emissions to air. However, this will take place within an enclosed and shielded	**0/-**

Stage VI: Size Reduce the RC/RPV (if appropriate); Transfer Packaged Waste to Proposed GDF **Air**	
environment thus reducing the potential effects of radiological and non radiological emissions to air. As such it is considered that the scale of emissions to air and the potential effects will be less than that identified within Option 1. The effects identified in relation to emissions to air through transportation of packaged waste to the proposed GDF are expected to be minimal.	
Option 3: Transport Packaged Waste to the Proposed GDF	
Assessment of Effects: Under Option 3 all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process) and consequently, effects on this objective will relate to the transportation of packaged waste to the proposed GDF only. The transportation of packaged waste is not expected to have any effect on air quality, under normal operating circumstances. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: This option has been assessed as having a neutral effect under this objective. The route of the transport of packaged waste to the proposed GDF is not known however exhaust emissions from HGV movements related to the transportation of ILW and LLW may contribute increases in particulate matter and gaseous pollutants (particularly NOx and carbon dioxide (CO_2) although these are expected to be minimal. Therefore it is determined that transportation of packaged waste is not expected to pose any effect to air, under normal operating circumstances.	**0**

Stage VII: Decommission SDP Facilities

Air

Option 1: Decommission Greenfield Sites

Assessment of Effects:

The decommissioning of the SDP facilities and ancillary infrastructure on a greenfield site would result in the generation of dust, particularly from demolition, excavation, soil stripping and transport of wastes on site. This could have an effect on local air quality if unmanaged. Exhaust emissions from demolition plant and diesel engine emissions from diesel generators used to supply non mains power may also contribute to increases in particulate matter and gaseous pollutants (particularly NO2 and carbon dioxide (CO2)).

It is assumed that all/most of the infrastructure and ancillary facilities as well as the dismantling, size reduction and interim storage facilities will be required to be demolished, including but not restricted to; docks, rail head, roads, cranes and admin offices. Furthermore, in order to restore the land to its original greenfield state all hardstanding will need to be removed increasing the levels of land excavation required relative to Options 2 and 3.

Decommissioning activities will involve the demolition, excavation, movement and treatment of radiologically contaminated material, particularly arising from the size reduction facility (e.g. the hot cell). Most radiologically contaminated materials are expected to be solid, comprising a selection of concrete and cut up apparatus such as pipes and cladding although there is some potential that small amounts of liquids (crud and sludge) from the effluent treatment plant will be present. However, it is assumed that all activities will be subject to BAT and ALARP and that containment mechanisms would be in place to prevent discharge to the environment. There is a potential risk of accidental discharge of radiation during decommissioning although the probability of any such discharges having a significant impact on air quality will be low given that decommissioning activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. These requirements will ensure that any discharges to the environment are both minimised, and within the limits defined in the site permit.

The greatest potential effect on air quality during demolition could be associated with any road movements of demolition materials from site. The number of HGV movements could be substantial; however, the alternatives of either barge or rail should also be explored. Exhaust emissions from demolition traffic (e.g. from HGVs, personnel vehicles and deliveries) could lead to a decrease in local air quality, particularly as a result of increased levels of nitrogen oxides, nitrogen dioxide (NO2) and particulates.

It is assumed that ambient air quality of a greenfield site will be good and as a consequence, the emissions arising from demolition traffic and decommissioning activities will have a negative effect on this local air quality in comparison to the baseline condition in the short term. Depending on the location and the proximity of local populations and other sensitive receptors (such as designated conservation sites), the effect may be considered to be significant. There is also the potential for negative effects on this objective to be felt as a result of accidental discharges of demolition-related materials to air. However, in both circumstances, it is considered that the probability of such effects will be low and the adoption of pollution control management procedures within a comprehensive EMP will help mitigate this risk.

Once the decommissioning activities are complete it is assumed that all SDP operational activities and associated road movements would cease along with any of the adverse effects these activities may have on air quality (Stages 3 to 6 of this assessment).

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage II of this assessment.

RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste options and, on a greenfield site, removal of docking facilities alongside other infrastructure would also be required. Therefore, it is expected that emissions to air from vehicle movements and decommissioning activities in the vicinity of the interim storage facility will be greater under this technical option.

Proposed Mitigation / Enhancements Measures:

- Where practicable, provision should be made for the transport of demolition and decommissioning wastes via rail or sea. All available transport options should be subject to environmental assessment to determine their effect.
- Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all

Stage VII: Decommission SDP Facilities

Air

vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency.

- Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators.
- Any risk of causing emissions to air from demolition and decommissioning activities should be reduced by making use of Best Available Technology and selecting suitable energy efficient, low emission equipment.
- The use of dense vegetation, screens and barriers to help reduce the effects of particulate matter should be considered, as should the orientation with respect to locally prevailing winds.
- Zoning of site so that increased dust is kept to a minimum.

Summary: Option 1 has been assessed as having a long term positive effect in relation to this objective as, following decommissioning, the SDP operational activities and the associated adverse effects on this objective will cease. However, the significant demolition required for both SDP facilities and all ancillary uses/infrastructure will have a negative effect on this objective in the short to medium term. Due to the scale of demolition required, there will also be a potentially significant number of vehicle movements to transport waste material offsite. Depending on whether this material is moved by road, rail or sea, there is potential for a substantial increase in emissions arising from HGV transportation to and from the site. The level of emissions to air related to decommissioning of the interim storage facility may be increased for RC storage as under this technical option, decommissioning of a relatively large interim storage facility will be required.	**-/+**

Option 2: Decommission Brownfield Sites

Assessment of Effects:

The demolition of the SDP facilities on a brownfield site would result in a range of effects similar to those outlined for Option 1. However, due to the assumed reduced levels of demolition required (as existing infrastructure would be left 'in situ' where possible), the scale of these potential effects is considered to be less.

As for Option 1, once the decommissioning activities are complete it is assumed that all SDP operational activities and associated road movements would cease along with any of the adverse effects these activities may have on air quality (Stages 3 to 6 of this assessment).

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage II of this assessment.

RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste options. Therefore, it is expected that emissions to air from vehicle movements and decommissioning activities in the vicinity of the interim storage facility will be greater under this technical option.

Proposed Mitigation / Enhancements Measures:

Additional measures beyond those proposed for Option 1 include:

- Make best use of existing buildings and infrastructure.
- Seek to reuse and recycle demolition materials.

Stage VII: Decommission SDP Facilities Air	
Summary: Option 2 has been assessed as having a long term positive effect in relation to this objective as, following decommissioning, the SDP operational activities and the associated adverse effects on this objective will cease. In the short to medium term, the demolition activities required for Option 2 will have a minor negative effect in relation to this objective although the scale and likelihood of this effect is considered to be less than for Option 1. This is primarily due to a reduction in the scale of effects associated with the demolition required assuming that some of the existing site infrastructure would be retained. Transport movements although reduced in comparison to that identified within Option1 would also be expected to contribute to a localised negative effect on air quality. The level of emissions to air related to decommissioning of the interim storage facility may be increased for RC storage as under this technical option, decommissioning of a relatively large interim storage facility will be required.	**-/+**

Option 3: Decommission an Existing Licensed/Authorised Site

Assessment of Effects:

The demolition of the SDP facilities constructed on an existing Licensed/Authorised site would result in a range of effects similar to those outlined for Options 1 and 2. However, due to the assumed reduced levels of demolition required (as existing infrastructure and some ancillary facilities would be left 'in situ' where possible), the scale of these potential effects is considered to be less.

As for Option 2 and 3, once the decommissioning activities are complete, it is assumed that all SDP operational activities and associated road movements would cease along with any of the adverse effects these activities may have on air quality (Stages 3 to 6 of this assessment).

Technical Options:

All three technical options will ultimately require the ILW to be packaged for disposal in the proposed GDF. Consequently, it is assumed that the total footprint of initial dismantling facilities will be similar across all options (between 15,000 and 20,000sqm). However, the size of the interim ILW storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage II of this assessment.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence of the technical options on their severity is also expected to be similar.

Proposed Mitigation / Enhancements Measures:

- No additional measures beyond those proposed for Option 2.

Summary: Option 3 has been assessed as having a long term positive effect in relation to this objective as, following decommissioning, the SDP operational activities and the associated adverse effects on this objective will cease. During the short to medium term Option 3 has been assessed as having a negative effect in relation to this objective although the scale and likelihood of this effect is considered to be less than that of Option 1 and potentially 2. This is primarily due to reduction in the scale of effects associated with the demolition required assuming that some of the existing site infrastructure would be retained. Transport movements although reduced in comparison to that identified within Option 1 would also be expected to contribute to a localised negative effect on air quality.	**-/+**

Stage VII: Decommission SDP Facilities Air	
The level of emissions to air related to decommissioning of the interim storage facility may be increased for RC storage as under this technical option, decommissioning of a relatively large interim storage facility will be required.	

7.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the air quality objective. **Box 7.2** provides a summary of the options that have been assessed.

Box 7.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 7.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality	-	-	-	**Potential Effects** The SDP would generate traffic movements on the local road network (refer to J. Material Assets (Transport)). Exhaust emissions from SDP traffic (e.g. staff, HGVs and heavy plant, concrete tankers and deliveries, the transport of waste) could lead to a decrease in local air quality adjoining local transport networks, particularly as a result of increased levels of nitrogen oxides, nitrogen dioxide (NO_2) and particulates. When considering the source of the material used, the distance and method of transportation would have a direct effect on overall emissions to air from transport (e.g. the different emissions associated with transport by road, rail or ship). Notwithstanding this, taking account of the scale of development, estimated transport movements and the timescales over which transport movements would occur, emissions associated with transport are not anticipated to be significant. At the Devonport and Rosyth dockyards, there is the potential for materials to be transported to the dockyards by ship. There is also the potential for LLW to be transported to the LLWR by rail. Submarine transportation would also result in emissions (e.g. from the diesel engine). Emissions would differ depending on the submarine transport method (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used), although taking account of the number of movements required, estimated to be one submarine movement per year, any potential impact on local air quality from submarine transportation is anticipated to be negligible. Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine itself during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on local air quality, although the likelihood of such an event occurring is exceptionally small. Modifications to existing facilities and the construction of new facilities for the SDP would generate dust, particularly earthworks, soil stripping, storage and use of materials on site and transport movements (traffic and plant). Exhaust emissions from plant and diesel engine emissions from diesel generators used to supply non mains power may also contribute to increases in particulate matter and gaseous pollutants (particularly NO_2 and carbon dioxide (CO_2)).
G.Air Minimise emissions of pollutant gases and particulates and enhance air quality *(continued)*	-	-	-	Separation of the RC is likely to result in the generation of dust, particularly from cutting and mechanical separation of the RC from the submarine hull. This activity is expected to take place in an open environment with limited opportunities or potential for shielding and thus any reduction in potential air emissions to the receiving environment. Exhaust emissions from plant machinery and diesel generators may also contribute increases in particulate matter and gaseous pollutants (particularly NO_x and CO_2 although again these are expected to be minimal. Subsequent size reduction of the RPV would take place within a shielded facility where the potential for any unplanned emissions would be minimal. Interim storage of the RC is assumed to be a relatively passive activity, with emissions to air associated with generators and mobile plant. These activities are unlikely to affect air quality. Estimated emissions associated wth SDP activities are not available at this stage; however there is not anticipated to be a substantial increase in emissions when compared to current levels at the Devonport and Rosyth dockyards and emissions are not anticipated to exceed permitted levels. The adoption of pollution control management procedures would help mitigate any potential nuisance from SDP activities on site. Any discharges of radioactive and non-radioactive gases and particulates would be strictly managed through the

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				Environmental Permitting regime and the use of BAT and ALARP principles; as such the risk of unacceptable or unplanned emissions is considered to be exceptionally low and there is considered to be minimal risk of significant effects on air quality during normal operations. Of the technical options, the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2 which due to its scale emissions during construction could be greater for the RC option. However, in the case of the RC option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for size reduction of the RC would not take place until the interim storage period is nearing completion. Separating activities into two phases would help to keep emissions below threshold levels where it could affect air quality. Although in the case of all of the technical options, as ALARP and BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on air quality during normal operations. The RC option is considered to carry the least risk of unplanned release of radioactive material associated with initial dismantling, as radioactive waste would be contained within the RC. As the RC option allows for the in-situ decay of short lived isotopes, following interim storage radioactivity levels would have reduced. The delay from interim storage before segregation begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality *(continued)*	-	-	-	In the case of this option, the RC would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the RC. Overall, this option could therefore generate fewer emissions associated with transport when compared to those options proposing interim storage at a remote site. Total vehicle movements associated with radioactive waste transportation to the LLWR and proposed GDF (once full segregation/size reduction of the RC has been completed) is expected to be the same across the technical options. However, the transport of LLW and ILW off-site would be delayed until after the interim storage period. During this delay there is the potential for more energy efficient vehicles or an increase in renewable fuels/electric vehicles which could decrease emissions, however this is very uncertain. <u>Devonport Dockyard</u> Air quality in Plymouth is generally good, with the key pollutants being NO_2 from traffic, and fine particles (PM_{10}) being an issue around docks where china clay is handled. In 2009, annual average NO_2 levels in Plymouth were between 32 and 42.7 µg m^{-3} against a statutory target of 40µg m^{-3}. Annual average PM_{10} levels were 26µg m^{-3} against a statutory target of 50µg m^{-3} (although the limit was exceeded on 21 days). There are three Air Quality Management Areas (AQMAs) in Plymouth, two for designated for NO_2 exceedences in the city centre and one for PM_{10}. Plymouth City Council is considering replacing the two individual site AQMAs in the city centre with one larger AQMA, which will include main transport routes into the city. There are no AQMAs covering the Devonport dockyard or its vicinity. Depending on routing, there is, however, the potential for traffic from Devonport dockyard to route through Plymouth City AQMAs. Existing licensed activities at Devonport dockyard include permitted releases to air. The radionuclides include Tritium, Carbon-14, Argon-41, as well as nuclides of lower radiological significance. In 2009, <100GBq of Tritium, 34.82GBq of Carbon-14, <1TBq of Argon 41, and <1MBq of other beta/gamma particulates were released into the air at Devonport dockyard. These gaseous discharges were all below permitted levels. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality *(continued)*	-	-	-	Emissions estimates are not available at this stage. However, taking account of the scale and nature of the activities to be undertaken is there not anticipated to be a substantial increase in emissions above current levels at Devonport dockyard, and emissions are not anticipated to exceed permitted levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities nuisance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)) and as such emissions associated with transport are not anticipated to have a significant impact on local air quality. Rosyth Dockyard Air quality in Fife is generally good. In 2005 annual average background levels were: PM_{10}: 11.8 µgm$_{-}^{3}$; Carbon monoxide (CO): 0.12mgm$_{-3}$; Benzene: 0.15µgm$_{-}^{3}$; 1, 3-butadiene: 0.03 µgm^{3}; NO_2: 5.69µgm$_{-}^{3}$; Annual average total NO_X: 7.25 µgm$_{-}^{3}$. Fife has localised areas of elevated air quality pollutants associated with road transport. Within Fife District there is one AQMA within Bonnygate, Cupar (over 40km to the north-east of Rosyth dockyard). There are no AQMA's covering Rosyth dockyard or its vicinity. In Rosyth, high concentrations of NO_2 and PM_{10} were recorded adjacent to Admiralty Road (to the north of the dockyard). However, further monitoring at Admiralty Road by Fife Council did not indicate a need to declare an AQMA. Existing licensed activities at Rosyth dockyard include permitted releases to air. The radionuclides include Tritium, Carbon-14, Argon-41, as well as nuclides of lower radiological significance. In 2009, gaseous discharges from Rosyth dockyard were below the limit of detection, and gamma dose rates could not be distinguished from background levels. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Emissions estimates are not available at this stage. However, taking account of the scale and nature of the activities to be undertaken is there not anticipated to be a substantial increase in emissions above current levels at Rosyth dockyard, and emissions are not anticipated to exceed permitted levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities nuisance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)) and as such emissions associated with transport are not anticipated to have a significant impact on local air quality. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Option1D could therefore potentially have a greater impact on local air quality as the range of construction activities would be greater, although no significant impacts on air from construction are anticipated.
G. Air Minimise	-	-	-	Devonport dockyard is located in the city of Plymouth in a built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is

Assessment Criteria	Score			Commentary
	1D	1R	1B	
emissions of pollutant gases and particulates and enhance air quality *(continued)*				situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards and the scale of development required, there is considered to be a greater potential for emissions of pollutants and particulates to create a nuisance for people when compared to Rosyth dockyard, as fewer sensitive receptors could be affected at Rosyth dockyard, although any impacts on air quality as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be minor. In the case of Option 1D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 1R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Any air quality impact associated with submarine transportation could therefore be greater for Option 1R, although any potential impact on local air quality from submarine transportation is anticipated to be negligible. Emissions associated with transport would vary between the two dockyards. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Devonport dockyard to impact on local air quality along the LLW transport route. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any local air quality impact from LLW transportation is anticipated to be minor. Overall, as there is a greater potential for emissions of pollutants and particulates to create a nuisance for people at Devonport dockyard and emissions associated with LLW transportation could be greater from Devonport dockyard when compared to Rosyth dockyard, and for there is considered to be a greater potential for adverse impacts with Option 1D in relation to air. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that in the case of the dual site option, transportation of submarines for dismantling could be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be de-fuelled, which would reduce any air quality impacts associated with submarine transportation.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality	-	-	-	**Potential Effects** The SDP would generate traffic movements on the local road network (refer to J. Material Assets (Transport)). Exhaust emissions from SDP traffic (e.g. staff, HGVs and heavy plant, concrete tankers and deliveries, the transport of waste) could lead to a decrease in local air quality adjoining local transport networks, particularly as a result of increased levels of nitrogen oxides, NO_2 and particulates. When considering the source of the material used, the distance and method of transportation would have a direct effect on overall emissions to air from transport (e.g. the different emissions associated with transport by road, rail or ship). Notwithstanding this, taking account of the scale of development, estimated transport movements and the timescales over which transport movements would occur, emissions associated with transport are not anticipated to be significant. At the Devonport and Rosyth dockyards, there is the potential for materials to be transported to the dockyards by ship. There is also the potential for LLW to be transported to the LLWR by rail. Submarine transportation would also result in emissions (e.g. from the diesel engine). Emissions would differ depending on the submarine transport method (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used), although taking account of the number of movements required, estimated to be one submarine movement per year, any potential impact on local air quality from submarine transportation is anticipated to be negligible. Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine itself during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on local air quality, although the likelihood of such an event occurring is exceptionally small. Modifications to existing facilities and the construction of new facilities for the SDP would generate dust, particularly earthworks, soil stripping, storage and use of materials on site and transport movements (traffic and plant). Exhaust emissions from plant and diesel engine emissions from diesel generators used to supply non mains power may also contribute to increases in particulate matter and gaseous pollutants (particularly NO_2 and CO_2). Separation of the RPV is likely to result in the generation of dust, particularly from cutting of the submarine hull. This activity is expected to be conducted within appropriate environmental containment measures. Exhaust emissions from plant machinery and diesel generators may also contribute increases in particulate matter and gaseous pollutants (particularly NO_x and CO_2 although again these are expected to be minimal. Dismantling activities also carry a remote risk of accidental discharges of contaminants to air. Subsequent segregation and size reduction of the RPV would take place within a shielded facility where the potential for any unplanned emissions would be minimal. Interim storage of the RPV is assumed to be a relatively passive activity, with emissions to air associated with generators and mobile plant. These activities are unlikely to affect air quality.
G. Air Minimise emissions of pollutant gases and particulates	-	-	-	Estimated emissions associated wth SDP activities are not available at this stage; however there is not anticipated to be a substantial increase in emissions when compared to current levels at the Devonport and Rosyth dockyards and emissions are not anticipated to exceed permitted levels. The adoption of pollution control management procedures would help mitigate any potential nuisance from SDP activities on site. Any discharges of radioactive

Assessment Criteria	Score			Commentary
	2D	2R	2B	
and enhance air quality *(continued)*				and non-radioactive gases and particulates would be strictly managed through the Environmental Permitting regime and the use of BAT and ALARP principles; as such the risk of unacceptable or unplanned emissions is considered to be very low and there is considered to be minimal risk of significant effects on air quality during normal operations. Of the technical options, the scale of development required for the RPV option would be less than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2 which due to its scale emissions during construction could be less for the RPV option. In addition, in the case of the RPV option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation and size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases would help to keep emissions below threshold levels where it could affect air quality. Although in the case of all of the technical options, as ALARP and BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on air quality during normal operations. The delay from interim storage before segregation/size reduction begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. In the case of this option, the RPV would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the RPV. Overall, this option could therefore generate fewer emissions associated with transport when compared to those options proposing interim storage at a remote site. Total vehicle movements associated with radioactive waste transportation to the LLWR and proposed GDF (once full segregation/size reduction of the RPV has been completed) is expected to be the same across the technical options. However, the transport of LLW and ILW off-site would be delayed until after the interim storage period. During this delay there is the potential for more energy efficient vehicles or an increase in renewable fuels/electric vehicles which could decrease emissions, however this is very uncertain.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality *(continued)*	-	-	-	Devonport Dockyard Air quality in Plymouth is generally good, with the key pollutants being NO_2 from traffic, and fine particles (PM_{10}) being an issue around docks where china clay is handled. In 2009, annual average NO_2 levels in Plymouth were between 32 and 42.7 µg m^{-3} against a statutory target of 40µg m^{-3}. Annual average PM_{10} levels were 26µg m^{-3} against a statutory target of 50µg m^{-3} (although the limit was exceeded on 21 days). There are three AQMAs in Plymouth, two for designated for NO_2 exceedences in the city centre and one for PM_{10}. Plymouth City Council is considering replacing the two individual site AQMAs in the city centre with one larger AQMA, which will include main transport routes into the city. There are no AQMAs covering the Devonport dockyard or its vicinity. Depending on routing, there is, however, the potential for traffic from Devonport dockyard to route through Plymouth City AQMAs. Existing licensed activities at Devonport dockyard include permitted releases to air. The radionuclides include Tritium, Carbon-14, Argon-41, as well as nuclides of lower radiological significance In 2009, <100GBq of Tritium, 34.82GBq of Carbon-14, <1TBq of Argon-41 and <1MBq of other beta/gamma particulates were released into the air at Devonport dockyard. These gaseous discharges were all below permitted levels. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Emissions estimates are not available at this stage. However, taking account of the scale and nature of the activities to be undertaken is there not anticipated to be a substantial increase in emissions above current levels at Devonport dockyard, and emissions are not anticipated to exceed permitted levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities nuisance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)) and as such emissions associated with transport are not anticipated to have a significant impact on local air quality. <u>Rosyth Dockyard</u> Air quality in Fife is generally good. In 2005 annual average background levels were: PM_{10}: 11.8 µgm.^{3}; Carbon monoxide (CO): 0.12mgm.$_{3}$; Benzene: 0.15µgm.^{3}; 1, 3-butadiene: 0.03 µgm^{3}; NO_2: 5.69µgm.^{3}; Annual average total NO_X: 7.25 µgm.^{3}. Fife has localised areas of elevated air quality pollutants associated with road transport. Within Fife District there is one AQMA within Bonnygate, Cupar (over 40km to the north-east of Rosyth dockyard). There are no AQMA's covering Rosyth dockyard or its vicinity. In Rosyth, high concentrations of NO_2 and PM_{10} were recorded adjacent to Admiralty Road (to the north of the dockyard). However, further monitoring at Admiralty Road by Fife Council did not indicate a need to declare an AQMA. Existing licensed activities at Rosyth dockyard include permitted releases to air. The radionuclides include Tritium, Carbon-14, Argon-41, as well as nuclides of lower radiological significance. In 2009, gaseous discharges from Rosyth dockyard were below the limit of detection, and gamma dose rates could not be distinguished from background levels. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality *(continued)*	-	-	-	Emissions estimates are not available at this stage. However, taking account of the scale and nature of the activities to be undertaken is there not anticipated to be a substantial increase in emissions above current levels at Rosyth dockyard, and emissions are not anticipated to exceed permitted levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities nuisance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)) and as such emissions associated with transport are not anticipated to have a significant impact on local air quality. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Option 2D could therefore potentially have a greater impact on local air quality as the range of construction activities would be greater, although no significant impacts on air from construction are anticipated. Devonport dockyard is located in the city of Plymouth in a built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				dockyard and along the waterfront, along with some residential housing and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards and the scale of development required, there is considered to be a greater potential for emissions of pollutants and particulates to create a nuisance for people when compared to Rosyth dockyard, as fewer sensitive receptors could be affected at Rosyth dockyard, although any impacts on air quality as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be minor. In the case of Option 2D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 2R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Any air quality impact associated with submarine transportation could therefore be greater for Option 2R, although any potential impact on local air quality from submarine transportation is anticipated to be negligible. Emissions associated with transport would vary between the two dockyards. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Devonport dockyard to impact on local air quality along the LLW transport route. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any local air quality impact from LLW transportation is anticipated to be minor. Overall, as there is a greater potential for emissions of pollutants and particulates to create a nuisance for people at Devonport dockyard and emissions associated with LLW transportation could be greater from Devonport dockyard when compared to Rosyth dockyard, there is considered to be a greater potential for adverse impacts with Option 2D in relation to air.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality *(continued)*	-	-	-	<u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that in the case of the dual site option, transportation of submarines for dismantling could be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be de-fuelled, which would reduce any air quality impacts associated with submarine transportation.

Options 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality	-/?	-/?	-/?	**Potential Effects** The SDP would generate traffic movements on the local road network (refer to J. Material Assets (Transport)). Exhaust emissions from SDP traffic (e.g. staff, HGVs and heavy plant, concrete tankers and deliveries, and the transport of RPV and packaged waste) could lead to a decrease in local air quality adjoining local transport networks, particularly as a result of increased levels of nitrogen oxides, NO_2 and particulates. When considering the source of the material used, the distance and method of transportation would have a direct effect on overall emissions to air from transport (e.g. the different emissions associated with transport by road, rail or ship). Notwithstanding this, taking account of the scale of development, estimated transport movements and the timescales over which transport movements would occur, emissions associated with transport are not anticipated to be significant. At the Devonport and Rosyth dockyards, there is the potential for materials to be transported to the dockyards by ship. There is also the potential for LLW to be transported to the LLWR by rail. Submarine transportation would also result in emissions (e.g. from the diesel engine). Emissions would differ depending on the submarine transport method (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used), although taking account of the number of movements required, estimated to be one submarine movement per year, any potential impact on local air quality from submarine transportation is anticipated to be negligible. Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine itself during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on local air quality, although the likelihood of such an event occurring is exceptionally small. Modifications to existing facilities and the construction of new facilities for the SDP would generate dust, particularly earthworks, soil stripping, storage and use of materials on site and transport movements (traffic and plant). Exhaust emissions from plant and diesel engine emissions from diesel generators used to supply non mains power may also contribute to increases in particulate matter and gaseous pollutants (particularly NO_2 and CO_2). Separation of the RPV is likely to result in the generation of dust, particularly from cutting of the submarine hull. This activity is expected to be conducted within appropriate environmental containment measures. Exhaust emissions from plant machinery and diesel generators may also contribute increases in particulate matter and gaseous pollutants (particularly NO_x and CO_2 although again these are expected to be minimal. Dismantling activities also carry a remote risk of accidental discharges of contaminants to air. Subsequent segregation and size reduction of the RPV would take place within a shielded facility where the potential for any unplanned emissions would be minimal. Interim storage of the RPV is assumed to be a relatively passive activity, with emissions to air associated with generators and mobile plant. These activities are unlikely to affect air quality.
G. Air Minimise emissions of pollutant gases and particulates	-/?	-/?	-/?	Any discharges of radioactive and non-radioactive gases and particulates would be strictly managed through the Environmental Permitting regime and the use of BAT and ALARP principles; as such the risk of unacceptable or unplanned emissions is considered to be very low and there is considered to be minimal risk of significant effects on air quality during normal operations.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
and enhance air quality				Estimated emissions associated wth SDP activities are not available at this stage, although there is not anticipated to be a substantial increase in emissions when compared to current levels at the Devonport and Rosyth dockyards and emissions are not anticipated to exceed permitted levels *(refer to impacts specific to the Devonport and Rosyth dockyards)*. In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation/size reduction (full dismantling of the RPV). At this stage a remote site has not been identified and consequently any local air quality impacts cannot be determined at this stage. Notwithstanding this, no significant impacts are anticipated due to the requirement to regulate and manage emissions of pollutants gases and particulates. Of the technical options, the scale of development required for the RPV option would be less than the other options, with the RPV option requiring a new interim storage area with a footprint of $801m^2$ which due to its scale emissions during construction could be less for the RPV option. In addition, construction would also take place on two different sites, reducing any impacts from SDP activities as the scale of activity undertaken at the respective sites would be less. In the case of the RPV option construction of SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases would help to keep emissions below threshold levels where it could affect air quality. Although in the case of all of the technical options, as ALARP and BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on air quality during normal operations.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality	-/?	-/?	-/?	The delay from interim storage before segregation/size reduction begins may provide sufficient time to enable new RPV removal and size reduction techniques to be developed and applied (in accordance with the application of BAT, which should ensure that future operational discharges of both radiological and non-radiological discharges will be below those presently experienced (or predicted from current technologies). However, at this point this is very uncertain. Total vehicle movements associated with radioactive waste transportation to the LLWR and proposed GDF (once full segregation/size reduction of the RPV has been completed) is expected to be the same across the technical options. However, as the RPV would need to be transported to the remote site following initial dismantling there would be additional emissions from transportation when compared to the options proposing storage at the point of waste generation, due to the requirement to transport the RPVs to a remote site for interim storage. During the interim storage delay there could be the potential for more energy efficient vehicles or an increase in renewable fuels/electric vehicles which could decrease emissions, however this is very uncertain. Devonport Dockyard Air quality in Plymouth is generally good, with the key pollutants being NO_2 from traffic, and fine particles (PM_{10}) being an issue around docks where china clay is handled. In 2009, annual average NO_2 levels in Plymouth were between 32 and 42.7 μg m^{-3} against a statutory target of 40μg m^{-3}. Annual average PM_{10} levels were 26μg m^{-3} against a statutory target of 50μg m^{-3} (although the limit was exceeded on 21 days). There are three AQMAs in Plymouth, two for designated for NO_2 exceedences in the city centre and one for PM_{10}. Plymouth City Council is considering replacing the two individual site AQMAs in the city centre with one larger AQMA, which will include main transport routes into the city. There are no AQMAs covering the Devonport dockyard or its vicinity. Depending on routing, there is, however, the potential for traffic from Devonport dockyard to route through Plymouth City AQMAs. Existing licensed activities at Devonport dockyard include permitted releases to air. The radionuclides include Tritium, Carbon-14, Argon-41, as well as nuclides of lower radiological significance In 2009, <100GBq of Tritium, 34.82GBq of Carbon-14, <1TBq of Argon-41 and <1MBq of other beta/gamma particulates were released into the air at Devonport dockyard.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				These gaseous discharges were all below permitted levels. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality	-/?	-/?	-/?	Emissions estimates are not available at this stage. However, taking account of the scale and nature of the activities to be undertaken is there not anticipated to be a substantial increase in emissions above current levels at Devonport dockyard, and emissions are not anticipated to exceed permitted levels. As dismantling activities would predominantly take place within the nuclear licensed site away from local communities nuisance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)) and as such emissions associated with transport are not anticipated to have a significant impact on local air quality. <u>Rosyth Dockyard</u> Air quality in Fife is generally good. In 2005 annual average background levels were: PM_{10}: 11.8 µgm.^{3}; Carbon monoxide (CO): 0.12mgm.$_{3}$; Benzene: 0.15µgm.^{3}; 1, 3-butadiene: 0.03 µgm^{3}; NO_2: 5.69µgm.^{3}; Annual average total NO_X: 7.25 µgm.^{3}. Fife has localised areas of elevated air quality pollutants associated with road transport. Within Fife District there is one AQMA within Bonnygate, Cupar (over 40km to the north-east of Rosyth dockyard). There are no AQMA's covering Rosyth dockyard or its vicinity. In Rosyth, high concentrations of NO_2 and PM_{10} were recorded adjacent to Admiralty Road (to the north of the dockyard). However, further monitoring at Admiralty Road by Fife Council did not indicate a need to declare an AQMA. Existing licensed activities at Rosyth dockyard include permitted releases to air. The radionuclides include Tritium, Carbon-14, Argon-41, as well as nuclides of lower radiological significance. In 2009, gaseous discharges from the dockyard were below detection, and gamma dose rates could not be distinguished from background levels. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Emissions estimates are not available at this stage. However, taking account of the scale and nature of the activities to be undertaken is there not anticipated to be a substantial increase in emissions above current levels at Rosyth dockyard, and emissions are not anticipated to exceed permitted levels. As dismantling activities would predominantly take place within the nuclear licensed site away from local communities nuisance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)) and as such emissions associated with transport are not anticipated to have a significant impact on local air quality. **<u>Comparison of the Options</u>** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. Dismantling activities undertaken at the Devonport and Rosyth dockyards would not differ and therefore there would be negligible difference in emissions associated with dismantling activities within the dockyards. Devonport dockyard is located in the city of Plymouth in a built up area surrounded by

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential and agricultural land. Taking account of the location of the dockyards and the scale of development required, there is considered to be a greater potential for emissions of pollutants and particulates to create a nuisance for people at Devonport dockuard when compared to Rosyth dockyard, although any impacts on air quality as a result of dismantling activities at both the Devonport and Rosyth dockyards is anticipated to be minor.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality	-/?	-/?	-/?	In the case of Option 3/4D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 3/4R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Any air quality impact associated with submarine transportation could therefore be greater for Option 3/4R, although any potential impact on local air quality from submarine transportation is anticipated to be negligible. Overall, as there is a greater potential for emissions of pollutants and particulates to create a nuisance for people at Devonport dockyard when compared to Rosyth dockyard there is therefore considered to be a greater potential for adverse impacts with Option 3/4D in relation to air. At this stage a remote site for interim storage and segregation/size reduction has not been identified and subsequently the potential for emissions to affect local populations is uncertain. The potential for effects would depend on the location of the remote site, the activities currently undertaken at the remote site and its proximity to local populations. Combination Option If both the Devonport and Rosyth dockyards are utilised for dismantling, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites for dismantling would enable faster dismantling of submarines, reducing the timescale of any air quality impacts associated with dismantling activities. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled, which would reduce any air quality impacts associated with submarine transportation.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality	-	-	-	<u>**Potential Effects**</u> The SDP would generate traffic movements on the local road network (refer to J. Material Assets (Transport)). Exhaust emissions from SDP traffic (e.g. staff, HGVs and heavy plant, concrete tankers and deliveries, the transport of waste) could lead to a decrease in local air quality adjoining local transport networks, particularly as a result of increased levels of nitrogen oxides, NO_2 and particulates. When considering the source of the material used, the distance and method of transportation would have a direct effect on overall emissions to air from transport (e.g. the different emissions associated with transport by road, rail or ship). Notwithstanding this, taking account of the scale of development, estimated transport movements and the timescales over which transport movements would occur, emissions associated with transport are not anticipated to be significant. At the Devonport and Rosyth dockyards, there is the potential for materials to be transported to the dockyards by ship. There is also the potential for LLW to be transported to the LLWR by rail. Submarine transportation would also result in emissions (e.g. from the diesel engine). Emissions would differ depending on the submarine transport method (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used), although taking account of the number of movements required, estimated to be one submarine movement per year, any potential impact on local air quality from submarine transportation is anticipated to be negligible. Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine itself during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on local air quality, although the likelihood of such an event occurring is exceptionally small. Modifications to existing facilities and the construction of new facilities for the SDP would generate dust, particularly earthworks, soil stripping, storage and use of materials on site and transport movements (traffic and plant). Exhaust emissions from plant and diesel engine emissions from diesel generators used to supply non mains power may also contribute to increases in particulate matter and gaseous pollutants (particularly NO_2 and CO_2).
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality. *(continued)*	-	-	-	Separation of the RPV is likely to result in the generation of dust, particularly from cutting of the submarine hull. This activity is expected to be conducted within appropriate environmental containment measures. Exhaust emissions from plant machinery and diesel generators may also contribute increases in particulate matter and gaseous pollutants (particularly NO_x and CO_2 although again these are expected to be minimal. Dismantling activities also carry a remote risk of accidental discharges of contaminants to air. Subsequent segregation and size reduction of the RPV would take place within a shielded facility where the potential for any unplanned emissions would be minimal. Interim storage of the PW is assumed to be a passive activity, with emissions to air associated with generators and mobile plant. These activities are unlikely to affect air quality. Estimated emissions associated wth SDP activities are not available at this stage; however there is not anticipated to be a substantial increase in emissions when compared to current levels at the Devonport and Rosyth dockyards and emissions are not anticipated to exceed

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				permitted levels. The adoption of pollution control management procedures would help mitigate any potential nuisance from SDP activities on site. Any discharges of radioactive and non-radioactive gases and particulates would be strictly managed through the Environmental Permitting regime and the use of BAT and ALARP principles; as such the risk of unacceptable or unplanned emissions is considered to be very low and there is considered to be minimal risk of significant effects on air quality during normal operations. Of the technical options, taking account of interim storage requirements the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with storage of PW expected to require1,005m^2. However, in the case of the PW option as it involves full early dismantling of the RPV and size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on air from SDP activities when compared to the RC and RPV options. As in the case of all of the technical options, as ALARP and BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on air quality during normal operations.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality. *(continued)*	-	-	-	In the case of this option, ILW would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the PW. Overall, there would be fewer transport movements associated with this option when compared to those options proposing interim storage at a remote site. Total vehicle movements associated with radioactive waste transportation to the LLWR and proposed GDF (once full segregation/size reduction of the RPV has been completed) is expected to be the same across the technical options. <u>Devonport Dockyard</u> Air quality in Plymouth is generally good, with the key pollutants being NO_2 from traffic, and fine particles (PM_{10}) being an issue around docks where china clay is handled. In 2009, annual average NO_2 levels in Plymouth were between 32 and 42.7 µg m^{-3} against a statutory target of 40µg m^{-3}. Annual average PM_{10} levels were 26µg m^{-3} against a statutory target of 50µg m^{-3} (although the limit was exceeded on 21 days). There are three AQMAs in Plymouth, two for designated for NO_2 exceedences in the city centre and one for PM_{10}. Plymouth City Council is considering replacing the two individual site AQMAs in the city centre with one larger AQMA, which will include main transport routes into the city. There are no AQMAs covering the Devonport dockyard or its vicinity. Depending on routing, there is, however, the potential for traffic from Devonport dockyard to route through Plymouth City AQMAs. Existing licensed activities at Devonport dockyard include permitted releases to air. The radionuclides include Tritium, Carbon-14, Argon-41, as well as nuclides of lower radiological significance In 2009, <100GBq of Tritium, 34.82GBq of Carbon-14, <1TBq of Argon-41 and <1MBq of other beta/gamma particulates were released into the air at Devonport dockyard. These gaseous discharges were all below permitted levels. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Emissions estimates are not available at this stage. However, taking account of the scale and nature of the activities to be undertaken is there not anticipated to be a substantial increase in emissions above current levels at Devonport dockyard, and emissions are not anticipated to exceed permitted levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities nuisance to surrounding local

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)) and as such emissions associated with transport are not anticipated to have a significant impact on local air quality. Rosyth Dockyard Air quality in Fife is generally good. In 2005 annual average background levels were: PM_{10}: 11.8 μgm^{-3}; Carbon monoxide (CO): 0.12mgm_{-3}; Benzene: 0.15μgm^{-3}; 1, 3-butadiene: 0.03 μgm^{3}; NO_2: 5.69μgm^{-3}; Annual average total NO_X: 7.25 μgm^{-3}. Fife has localised areas of elevated air quality pollutants associated with road transport. Within Fife District there is one AQMA within Bonnygate, Cupar (over 40km to the north-east of Rosyth dockyard). There are no AQMA's covering Rosyth dockyard or its vicinity. In Rosyth, high concentrations of NO_2 and PM_{10} were recorded adjacent to Admiralty Road (to the north of the dockyard). However, further monitoring at Admiralty Road by Fife Council did not indicate a need to declare an AQMA.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality. *(continued)*	-	-	-	Existing licensed activities at Rosyth dockyard include permitted releases to air. The radionuclides include Tritium, Carbon-14, Argon-41, as well as nuclides of lower radiological significance. In 2009, gaseous discharges from Rosyth dockyard were below the limit of detection, and gamma dose rates could not be distinguished from background levels. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Emissions estimates are not available at this stage. However, taking account of the scale and nature of the activities to be undertaken is there not anticipated to be a substantial increase in emissions above current levels at Rosyth dockyard, and emissions are not anticipated to exceed permitted levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities nuisance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)) and as such emissions associated with transport are not anticipated to have a significant impact on local air quality. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Option4D could therefore potentially have a greater impact on local air quality when compared to Option 5R as the range of construction activities would be greater, although no significant impacts on air from construction are anticipated. Devonport dockyard is located in the city of Plymouth in a built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing and agricultural land. Taking account of the location of the Devonport and Rosyth dockyards and the scale of development required, there is considered to be a greater potential for emissions of pollutants and particulates to create a nuisance for people when compared to Rosyth dockyard, as fewer sensitive receptors could be affected at Rosyth dockyard, although any impacts on air quality as a result of SDP activities at both the Devonport and Rosyth dockyards is anticipated to be minor. In the case of Option 5D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				case of Option 5R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Any air quality impact associated with submarine transportation could therefore be greater for Option 5R when compared to Option 4D, although any potential impact on local air quality from submarine transportation is anticipated to be negligible.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality. *(continued)*	-	-	-	Emissions associated with transport would vary between the two dockyards. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Following interim storage, taking into account distance only, there is a greater potential for transport of LLW from Devonport dockyard to impact on local air quality along the LLW transport route. Notwithstanding this, taking account of the estimated number of LLW transport movements which is unlikely to result in a discernible increase in traffic on local road networks, and the timescales over which LLW would be transported off-site, any local air quality impact from LLW transportation is anticipated to be minor. Overall, as there is a greater potential for emissions of pollutants and particulates to create a nuisance for people at Devonport dockyard and emissions associated with LLW transportation could be greater from Devonport dockyard when compared to Rosyth dockyard, there is considered to be a greater potential for adverse impacts with Option 4D when compared to Option 5R in relation to air. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. At this stage no assumption can be made about which of the two dockyards would host the segregation/size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage.

Option 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality	-/?	-/?	-/?	**Potential Effects** The SDP would generate traffic movements on the local road network (refer to J. Material Assets (Transport)). Exhaust emissions from SDP traffic (e.g. staff, HGVs and heavy plant, concrete tankers and deliveries, and the transport of RPV and packaged waste) could lead to a decrease in local air quality adjoining local transport networks, particularly as a result of increased levels of nitrogen oxides, NO_2 and particulates. When considering the source of the material used, the distance and method of transportation would have a direct effect on overall emissions to air from transport (e.g. the different emissions associated with transport by road, rail or ship). Notwithstanding this, taking account of the scale of development, estimated transport movements and the timescales over which transport movements would occur, emissions associated with transport are not anticipated to be significant. At the Devonport and Rosyth dockyards, there is the potential for materials to be transported to the dockyards by ship. There is also the potential for LLW to be transported to the LLWR by rail. Submarine transportation would also result in emissions (e.g. from the diesel engine). Emissions would differ depending on the submarine transport method (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used), although taking account of the number of movements required, estimated to be one submarine movement per year, any potential impact on local air quality from submarine transportation is anticipated to be negligible. Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine itself during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have an impact on local air quality, although the likelihood of such an event occurring is exceptionally small. Modifications to existing facilities and the construction of new facilities for the SDP would generate dust, particularly earthworks, soil stripping, storage and use of materials on site and transport movements (traffic and plant). Exhaust emissions from plant and diesel engine emissions from diesel generators used to supply non mains power may also contribute to increases in particulate matter and gaseous pollutants (particularly NO_2 and CO_2).
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality. *(continued)*	-/?	-/?	-/?	Separation of the RPV is likely to result in the generation of dust, particularly from cutting of the submarine hull. This activity is expected to be conducted within appropriate environmental containment measures. Exhaust emissions from plant machinery and diesel generators may also contribute increases in particulate matter and gaseous pollutants (particularly NO_x and CO_2 although again these are expected to be minimal. Dismantling activities also carry a remote risk of accidental discharges of contaminants to air. Subsequent segregation and size reduction of the RPV would take place within a shielded facility where the potential for any unplanned emissions would be minimal. Interim storage of the RPV is assumed to be a relatively passive activity, with emissions to air associated with generators and mobile plant. These activities are unlikely to affect air quality. However the adoption of pollution control management procedures would help mitigate any potential nuisance from SDP activities on site. Any discharges of radioactive and non-radioactive gases and particulates would be strictly managed through the Environmental Permitting regime and the use of BAT and ALARP principles; as such the risk of unacceptable or unplanned emissions is considered to be very low and there is considered

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				to be minimal risk of significant effects on air quality during normal operations. Estimated emissions associated wth SDP activities are not available at this stage, although there is not anticipated to be a substantial increase in emissions when compared to current levels at the Devonport and Rosyth dockyards and emissions are not anticipated to exceed permitted levels *(refer to impacts specific to the Devonport and Rosyth dockyards)*. In the case of this option, following segregation and size reduction of the RPV the PW would be transported off the segregation/size reduction site to a remote site for interim storage. At this stage a remote site has not been identified and consequently any local air quality impacts cannot be determined at this stage. Notwithstanding this, no significant impacts are anticipated due to the requirement to regulate and manage emissions of pollutants gases and particulates. Of the technical options, taking account of interim storage requirements the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with storage of PW expected to require1,005m^2. However, in the case of the PW option as it involves full early dismantling of the RPV and segregation/size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on water from SDP activities when compared to the RC and RPV options. Notwithstanding this, construction would take place on two different sites, reducing any impacts from SDP activities as the scale of activity undertaken at the respective sites would be less. Although in the case of all of the technical options, as ALARP and BAT principles would be adopted and the risk of unacceptable or unplanned discharge is considered to be very low there would be minimal risk of significant effects on air quality during normal operations.
G. Air Minimise emissions of pollutant gases and particulates and enhance air quality. *(continued)*	-/?	-/?	-/?	Total vehicle movements associated with radioactive waste transportation to the LLWR and proposed GDF (once full segregation/size reduction of the RPV has been completed) is expected to be the same across the technical options. However, as the RPVs would need to be transported to another dockyard for segregation/size reduction and the PW transported from the segregation/size reduction site to a remote site there would be additional emissions from transportation when compared to the options proposing storage at the point of waste generation. <u>Devonport Dockyard</u> Air quality in Plymouth is generally good, with the key pollutants being NO_2 from traffic, and fine particles (PM_{10}) being an issue around docks where china clay is handled. In 2009, annual average NO_2 levels in Plymouth were between 32 and 42.7 µg m^{-3} against a statutory target of 40µg m^{-3}. Annual average PM_{10} levels were 26µg m^{-3} against a statutory target of 50µg m^{-3} (although the limit was exceeded on 21 days). There are three AQMAs in Plymouth, two for designated for NO_2 exceedences in the city centre and one for PM_{10}. Plymouth City Council is considering replacing the two individual site AQMAs in the city centre with one larger AQMA, which will include main transport routes into the city. There are no AQMAs covering the Devonport dockyard or its vicinity. Depending on routing, there is, however, the potential for traffic from Devonport dockyard to route through Plymouth City AQMAs. Existing licensed activities at Devonport dockyard include permitted releases to air. The radionuclides include Tritium, Carbon-14, Argon-41, as well as nuclides of lower radiological significance In 2009, <100GBq of Tritium, 34.82GBq of Carbon-14, <1TBq of Argon-41 and <1MBq of other beta/gamma particulates were released into the air at Devonport dockyard. These gaseous discharges were all below permitted levels. Devonport dockyard is not accessible to the public during normal operations. However, tours of the Devonport Naval Base are currently operated as a joint venture between the Royal Navy and Babcock. The former nuclear-powered submarine Courageous has been opened as a visitor attraction and a heritage area has been developed in the historic South Yard that is regularly opened up to the public on set weekends throughout the year. The area surrounding the Devonport dockyard predominantly comprises commercial and

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Emissions estimates are not available at this stage. However, taking account of the scale and nature of the activities to be undertaken is there not anticipated to be a substantial increase in emissions above current levels at Devonport dockyard, and emissions are not anticipated to exceed permitted levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities nuisance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)) and as such emissions associated with transport are not anticipated to have a significant impact on local air quality.
G.Air Minimise emissions of pollutant gases and particulates and enhance air quality. *(continued)*	-/?	-/?	-/?	<u>Rosyth Dockyard</u> Air quality in Fife is generally good. In 2005 annual average background levels were: PM_{10}: 11.8 µgm.^{3}; Carbon monoxide (CO): 0.12mgm$_{-3}$; Benzene: 0.15µgm.^{3}; 1, 3-butadiene: 0.03 µgm^{3}; NO_2: 5.69µgm.^{3}; Annual average total NO_X: 7.25 µgm.^{3}. Fife has localised areas of elevated air quality pollutants associated with road transport. Within Fife District there is one AQMA within Bonnygate, Cupar (over 40km to the north-east of Rosyth dockyard). There are no AQMA's covering Rosyth dockyard or its vicinity. In Rosyth, high concentrations of NO_2 and PM_{10} were recorded adjacent to Admiralty Road (to the north of the dockyard). However, further monitoring at Admiralty Road by Fife Council did not indicate a need to declare an AQMA. Existing licensed activities at Rosyth dockyard include permitted releases to air. The radionuclides include Tritium, Carbon-14, Argon-41, as well as nuclides of lower radiological significance. In 2009, gaseous discharges from the dockyard were below detection, and gamma dose rates could not be distinguished from background levels. It is understood that Rosyth Dockyard is not accessible to the public. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. Emissions estimates are not available at this stage. However, taking account of the scale and nature of the activities to be undertaken is there not anticipated to be a substantial increase in emissions above current levels at Rosyth dockyard, and emissions are not anticipated to exceed permitted levels. As SDP activities would predominantly take place within the nuclear licensed site away from local communities nuisance to surrounding local communities is anticipated to be minor and primarily related to transport movements to and from the dockyard, which are not anticipated to result in a discernable increase in traffic on the local road network (refer to J. Material Assets (Transport)) and as such emissions associated with transport are not anticipated to have a significant impact on local air quality. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and the scale of new development required could be greater at Devonport dockyard. Option 6/8D could therefore potentially have a greater impact on local air quality when compared to Option 6/8R as the range of construction activities would be greater, although no significant impacts on air from construction are anticipated. Devonport dockyard is located in the city of Plymouth in a built up area surrounded by commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. Rosyth dockyard in comparison is situated in a less built up and populated area on the edge of the town of Rosyth with the surrounding area comprising some commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential and agricultural land.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				Taking account of the location of the dockyards and the scale of development required, there is considered to be a greater potential for emissions of pollutants and particulates to create a nuisance for people at Devonport dockyard when compared to Rosyth dockyard, although any impacts on air quality as a result of dismantling activities at both the Devonport and Rosyth dockyards is anticipated to be minor. In the case of Option 6/8D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 6/8R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Any air quality impact associated with submarine transportation could therefore be greater for Option 6/8R, although any potential impact on local air quality from submarine transportation is anticipated to be negligible.
G.Air Minimise emissions of pollutant gases and particulates and enhance air quality. *(continued)*	-/?	-/?	-/?	Overall, as there is a greater potential for emissions of pollutants and particulates to create a nuisance for people at Devonport dockyard when compared to Rosyth dockyard there is therefore considered to be a greater potential for adverse impacts with Option 6/8D in relation to air. At this stage a remote site for interim storage has not been identified and subsequently the potential for emissions to affect local populations is uncertain. The potential for effects would depend on the location of the remote site, the activities currently undertaken at the remote site and its proximity to local populations. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined. However, it is noted that as submarine dismantling activities would be undertaken on three different sites (initial dismantling of the RPV taking place at one dockyard, and full segregation of the RPV taking place at the other dockyard and interim storage of the PW at a remote site), this combination option could result in a greater number of transport movements compared to Options 6/8D and 6/8R. Option 6/8B could therefore have a greater potential for local air quality impacts associated with transport. Notwithstanding this, undertaking SDP activities on three different sites would reduce disturbance levels.

Appendix A

UNCLASSIFIED

SUBMARINE DISMANTLING PROJECT

Environmental Report

Appendix A Part II

(Topics A8 to A14)

October 2011

de&s
SUBMARINES

Defence
Infrastructure
Organisation

This Appendix A (Part II) contains information on the following topics:

- Climate Change and Energy Use;
- Coastal Change and Flood Risk;
- Transport;
- Waste Management;
- Land Use and Materials;
- Cultural Heritage;
- Landscape and Townscape.

Each topic section contains:

- introduction - provides an overview and definition of the topic;
- summary of national and subregional plans and programmes - provides an overview of the policy context in which the SDP sits;
- overview of the national and sub-regional baseline - provides an overview of the baseline and the key topic specific baseline factors which will need to be considered as part of the assessment;
- existing problems - highlights some of the existing pressures on the topic area, particularly in relation to the SDP;
- likely evolution of the baseline - provides an overview of how the baseline is likely to change in the absence of the SDP, an understanding of this is key to understanding the effects of the SDP on the topic area;
- assessment objective and guide questions together with guidance as to how the significance of potential effects has been determined;
- generic assessment - including information on the potential nature and scale of effects, proposed mitigation measures (where appropriate) and measures for enhancement, assumptions and uncertainties and additional information that may be require;
- integrated options assessment - including information on the potential nature and scale of effects, proposed mitigation measures (where appropriate) and measures for enhancement, assumptions and uncertainties and additional information that may be require.

A8. Climate Change and Energy Use

8.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on climate change and energy use. Information is presented for both national and sub-regional levels.

Climate change and energy use within this context in concerned with increasing the likelihood of climate change effects through greenhouse gas emissions and the ability to adapt to predicted climate change effects.

There are links between the climate change and energy use topic and other topics in the SEA, specifically biodiversity and nature conservation, air, coastal change and flood risk, and traffic and material assets (transport).

8.2 Summary of Plans and Programmes

8.2.1 International

The ***United Nations Framework Convention on Climate Change*** (UNFCCC) sets an overall framework for international action to tackle the challenges posed by climate change. The Convention sets an ultimate objective of stabilising greenhouse gas concentrations *"at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system."* The Convention requires the development and regular update of greenhouse gas emissions inventories from industrialised countries, with developing countries also being encouraged to carry out inventories. The countries who have ratified the Treaty, known as the Parties to the Convention, agree to take climate change into account in such matters as agriculture, industry, energy, natural resources and where activities involve coastal regions. The Parties also agree to develop national programmes to slow climate change.

The ***Kyoto Protocol***, adopted in 1997, is the key international mechanism agreed to reduce emissions of greenhouse gases. The Kyoto Protocol sets binding targets for 37 industrialised countries and the

European Community for reducing greenhouse gas emissions. These targets equate to an average of 5% reductions relative to 1990 levels over the five-year period 2008-2012. The key distinction between this and the UNFCCC is that the Convention encourages nations to stabilise greenhouse gases while the Kyoto Protocol commits them to doing so through greenhouse gas reductions. Countries must meet their targets primarily through national measures however, the Kyoto Protocol offers them an additional means of meeting their targets by way of three market-based mechanisms: emissions trading, the clean development mechanism (CDM) and Joint Implementation (JI).

As the current Kyoto Protocol period draws to a close, a new agreement is being negotiated. The United Nations Climate Change Conference in Poznań during December 2008 established a commitment from governments that during 2009, a new "ambitious and effective international response to climate change" would be negotiated, and then agreed in Copenhagen at the end of 2009. However, the outcome of the Copenhagen summit was inconclusive and further negotiation took place at the United Nations Climate Change Conference held in Cancun in 2010. The Cancun Summit resulted in the adoption of the Cancun Agreements, a set of significant decisions by the international community to address the long-term challenge of climate change. This document presents information communicated by Parties included in Annex I to the Convention on the quantified economy-wide emission reduction targets of these Parties for 2020 and, where available, beyond that date, as well as associated context, conditions and considerations provided by Parties when they communicated their quantified economy-wide emissions reduction targets. The next United Nations Climate Change Conference is due to be held in April 2011 at Bangkok, Thailand, which will comprise a series of workshops discussing implementation of the Cancun Agreement.

The ***EU Emissions Trading Scheme (EU ETS)*** is a Europe wide scheme which aims to reduce emissions of carbon dioxide and combat the serious threat of climate change and has been in place since 2005. EU ETS puts a price on carbon that businesses use and creates a market for carbon. It allows countries that have emission units to spare (emissions permitted to them but not "used") to sell this excess capacity to countries which are likely to exceed their own targets. Since carbon dioxide (CO_2) is the principal greenhouse gas, this is often described as a carbon market or trading in carbon; the total amount of carbon emissions within the trading scheme being limited, and reduced over time. There are other units which can be transferred under the scheme, each equal to one tonne of CO_2, for example:

- a removal unit (RMU) on the basis of land use, land-use change and forestry (LULUCF) activities such as reforestation;
- an emission reduction unit (ERU) generated by a joint implementation project; and
- a certified emission reduction (CER) generated from a clean development mechanism project activity.

The ***EU Sixth Environmental Action Plan (EAP) (2002 – 2012)*** reviews the significant environmental challenges and provides a framework for European environmental policy up to 2012. The four priority areas are Climate Change; Nature and Biodiversity; Environment and Health; Natural Resources and Waste. The action plan highlights that ambitious action is needed to reduce global emissions particularly after 2012 when Kyoto's targets expire.

8.2.2 National

UK

In the UK, the ***Climate Change Act (2008)*** introduces legislative targets for reducing the UK's impacts on climate change and the need to prepare for its now inevitable impacts. The Act sets binding targets for a reduction in CO_2 emissions of 80% by 2050, compared to a 1990 baseline. Interim targets and five-year carbon budget periods will be used to ensure progress towards the 2050 target. The Climate Change Act 2008 also requires the Government, on a regular basis, to assess the risks to the UK from the impact of climate change and report to Parliament. The first ***Climate Change Risk Assessment*** is to be published by 2012. Government will be required to publish and regularly update a programme setting out how the UK will address these likely impacts, based on the principles of sustainable development, thereby ensuring that environmental, economic and social issues are all fully considered. The Climate Change Act 2008 also introduced powers for Government to require public bodies and statutory undertakers (in this context these are utilities companies which provide a public service) to carry out their own risk assessments and make plans to address those risks.

The ***Low Carbon Transition Plan*** plots how the UK will meet the 34% cut in emissions on 1990 levels by 2020 and the ***Renewables Strategy (2009)*** sets out the path for the UK to meet the legally-binding target to ensure 15% of energy to come from renewable sources by 2020.

Climate Change - The UK Programme 2006: Tomorrow's Climate Today's Challenge **(2006)** sets out the Government's commitments both at international and domestic levels to meet the challenge of climate change. It also sets out our approach to strengthening the role that individuals can play. The package of existing and new policy measures in the Programme are projected to reduce carbon dioxide emissions to 15 -18 per cent below 1990 levels - the new measures saving 12 million tonnes of carbon by 2010.

The ***CRC Energy Efficiency Scheme (2010)*** is a Government backed legislative carbon emissions trading scheme covering large business and public sector organisations. CRC is intended to have a significant impact on reducing UK carbon emissions and offers the potential to save money through energy efficiency. It is designed to drive changes in behaviour and infrastructure, generate corporate awareness of the detrimental impacts of carbon emissions, and improve energy management practice. Organisations that meet the criteria to participate have to monitor emissions from energy use, report these emissions annually, and purchase and surrender a corresponding number of carbon emission allowances on a cap and trade basis. CRC is considered to be broadly revenue neutral to the Exchequer. All revenue raised from the annual sale of allowances is recycled back to participants. A proportion of this repayment is based on the participant's performance in the Scheme.

The ***Greening Government Commitment*** was announced in March 2011, which replace the SOGE targets which expired at the end of 2010/11. This framework is intended to reduce its greenhouse gas emissions and ensure that the Government's estate is resilient to the impacts of changing climate. Included in the framework are the following targets:

- Reduce greenhouse gas emissions from a 09/10 baseline from the whole estate and business-related transport:
    - cut carbon emissions from Central Government offices by 10% in 2010/11 and all ministerial HQs to publish online real time energy use information
    - cut domestic business travel flights by 20% by 2015 from a 09/10 baseline.

Contained within the ***MOD Sustainable Development Strategy (2008), MOD Sustainable Development Report and Action Plan (2008)*** and the ***MOD Climate Change Strategy (2009)*** are several objectives relevant to climate change including;

- to be a leader amongst UK Government departments and Defence departments in EU and NATO States in the sustained reduction of CO_2 and other GHG emissions, and to ensure the continued delivery of Defence capability in a changing climate;
- ensure that the effect of emissions from the GHGs that result from defence activities are continually reduced, such that Defence will eventually not be a significant contributor to the causes of climate change; and
- agree and implement an effective process to enable Defence activities to continually adapt to a changing climate, such that Defence capability is not compromised and any potential benefits from the future climate are realised.

England

Policy Planning Statement 1 (PPS1) sets out the Government's overarching policy for the delivery of sustainable development through the planning system. ***Planning and Climate Change: Supplement to Planning Policy Statement 1*** sets out how planning for new homes, jobs and infrastructure should help to ensure places with lower carbon emissions and resilience to the climate change. ***Planning Policy Statement 25 (PPS25)*** includes guidance on the consideration of climate change when development is in an area at risk of flood. ***Planning Policy Statement 22(PPS22)*** aims to encourage positive planning which facilitates renewable energy developments.

Scotland

The guiding principles for sustainable development and climate change from the UK strategy are reflected in Scotland's program within the ***Climate Change (Scotland) Act (2009)***. Included within the Act is the target to reduce Scotland's emissions of greenhouse gases by 80% by 2050 and an interim target of at least 42% reduction in emissions for 2020.

Scottish Planning Policy (SPP) (2008) includes the target for 50% of Scotland's electricity to be generated from renewable sources by 2020 and 11% of heat demand to be met from renewable sources.

Strategy for Scotland; Energy Efficiency and Micro-generation: Achieving a Low Carbon Future: A Strategy for Scotland: The Scottish Government Response (2008) sets out the Scottish Executive's aims for improving energy efficiency and encouraging a greater uptake of micro-generation including using an action planning process to set energy efficiency and micro-generation and to monitor progress.

Wales

Planning Policy Wales (2010) (PPW) sets out the land use planning policies of the Welsh Assembly Government. Regarding climate change and energy use PPW sets out several objectives and includes the target to achieve annual carbon reduction-equivalent emissions reductions of 3% per year by 2011 in areas of devolved competence.

A Low Carbon Revolution: The Welsh Assembly Government Energy Policy Statement (2010) sets out the Welsh Assembly Government's ambitions for low carbon energy in Wales.

Technical Advice Note 8 (TAN8) provides advice on renewable energy and planning including in relation to offshore wind and other onshore renewable energy technologies. ***Technical Advice Note 12 (TAN 12)*** sets out the Assembly Government's policies and objectives in respect of the design of new development. In relation to climate change and energy, these objectives include: achieving efficient use and protection of natural resources; and designing for change.

Northern Ireland

The new Northern Ireland Executive's first ***Programme for Government*** sets out plans and priorities for 2008-2011 together with some longer term aspirations and intentions. Included within the programme is the target for a 25% decrease in Northern Ireland's total greenhouse gas emissions by 2025.

8.2.3 Sub-regional locations

Plymouth

In Plymouth City Council's report entitled ***Climate Change: the Impacts and Implication for Plymouth*** provides an overview of the threats, causes and reality of climate change. Also included are a set or recommendations based on both the UK and the South West.

Policy CS20 Sustainable Resource Use within the ***Plymouth Core Strategy Development Plan Document*** actively promotes develops which utilise natural resources in as an efficient and sustainable way as possible. This will include:

- Requiring all proposals for non-residential developments exceeding 1,000 square metres of gross floorspace, and new residential developments comprising 10 or more units (whether new build or conversion) to incorporate onsite renewable energy production equipment to off-set at least 10% of predicted carbon emissions for the period up to 2010, rising to 15% for the period 2010-2016.

- Ensuring building design reduces energy consumption by appropriate methods such as high standards of insulation, avoiding development in areas subject to significant effects from shadow, wind and frost, using natural lighting and ventilation, capturing the sun's heat, where appropriate.

In the Climate Change Working Group's report entitled ***Climate Change – The Impacts and Implications for Plymouth*** the following recommendations are made:

- The responsibility of 'lead organisation' in climate change and sustainable energy matters should remain with the City Council until such time as a more appropriate, alternative, multi-agency organisation can be established to take on this role.

- The Nottingham Declaration on Climate Change (a public statement of commitment) should be signed by Plymouth City Council on behalf of the wider Plymouth 2020 Partnership.

- The elements of the Cities for Climate Change Protection programme should be adopted by both Plymouth City Council and the Plymouth 2020 Partnership. The milestones set out in this programme and, where possible, regional or national UK Climate Change protocols should be the key elements of Plymouth's Climate Change Action Plan.

Fife

The objectives in the ***Fife Council Environmental Policy (2009)*** are to:

- respond to the national aim of reducing CO2 emissions to combat global climate change by integrating carbon management into Council business and implementing action to reduce emissions;
- lead the development and implementation of an effective Fife-wide sustainable energy strategy that will minimise the environmental impact of energy supply and use and ensure affordable and secure energy supplies are available to Fife's communities;
- encourage low carbon and energy efficient new developments and renewable energy use through appropriate land use policy and planning; and
- recover heat and energy from municipal waste.

Fife's Structure Plan 2006-2026 includes ***Policy SS1: Settlement development strategy*** which states that master plans lead or adopted by the council incorporating development briefs will address, amongst other sustainability objectives, energy efficiency and the use of energy sources.

8.3 Overview of the Baseline

8.3.1 National

UK

Total (final) energy consumption in the UK in 2009 was 1,604,618 GWH[1]. This was split between energy sources in the following proportions:

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[1] DECC, Total Final Energy Consumption at sub-national level
http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/total_final/1094-total-subnatl-final-energy-cons-2005-2008.xls&minwidth=true

- petroleum: 41.1%;
- natural gas: 36.5%;
- electricity: 19.0%; and
- others: 3.6% (includes coal, manufactured fuels, biomass, etc.). [1]

In 2009 in Great Britain the average commercial and industrial electricity usage per customer was 0.076 GWh[2] and the average commercial and industrial gas usage per customer was 0.664 GWh. [3]

In 2009, UK net emissions of Carbon dioxide (CO_2) were provisionally estimated to be 480.9 million tonnes.[4] CO_2 accounts for around 85% of total UK greenhouse gas emissions.[5] In 2009, 39% of CO_2 emissions were from the energy supply sector, 25% from road transport, 15% from business and 16% from residential fossil fuel use.

In 2009, UK emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were provisionally estimated to be 574.6 million tonnes CO_2 equivalent. This was 8.6% lower than the 2008 figure of 628.3 million tonnes. [6]

All areas of the UK are getting warmer, and the warming is greater in summer than in winter.[7]

There is little change in the amount of precipitation (rain, hail, snow etc) that falls annually, but more is falling in the winter, with drier summers, for much of the UK.[7] Sea levels are rising, and are greater in the south of the UK than the north.[7] The widespread flooding events of 2007 cannot be directly attributed to climate change but it is expected to see more extreme rainfall events in the future, and hence more flooding as our climate changes.

In 2008-09 the MOD produced 5.6 million tonnes of CO_2.[8] Over 2007-08 1.9 million tonnes of CO_2 was from estate energy use; 4.1 million tonnes of CO_2 was from motive fuel use; and 0.1 million tonnes of

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[2] DECC, Sub-national authority electricity consumption statistics 2005 to 2009 http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/electricity/1089-subnal-auth-electricity-cons-2005-2009.xls&minwidth=true

[3] DECC, Sub-national authority gas consumption statistics 2005 to 2009 http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/gas/1088-subnat-gas-sales-2005-2009.xls&minwidth=true

[4] DECC Statistical Release March 2010, http://www.decc.gov.uk/en/content/cms/statistics/climate_change/gg_emissions/uk_emissions/2009_prov/2009_prov.aspx

[5] Provisional 2010 UK Greenhouse Gas emissions http://www.decc.gov.uk/assets/decc/statistics/climate_change/1_20100325084241_e_@@_ghgnationalstatsrelease.pdf

[6] DECC Statistical Release March 2010, http://www.decc.gov.uk/en/content/cms/statistics/climate_change/gg_emissions/uk_emissions/2009_prov/2009_prov.aspx

[7] Department for Energy and Climate Change: 2007 Greenhouse Gas Emissions, Final Figures 3rd February 2009, http://www.decc.gov.uk/assets/decc/202_20090326104955_e_@@_greenhousegasemissions.pdf

CO_2 was from business travel. Of the 4.1 million tonnes of CO_2 from fuel use: 0.4 million tonnes CO_2 was from ground fuel; 0.8 million tonnes CO_2 was from marine fuel; and 2.9 million tonnes of CO_2 was from aviation fuel.[9]

England

The total (final) energy consumption in England was 1,313,341 million tonnes oil equivalent in 2008. This was split between energy sources in the following proportions:[10]

- petroleum: 39.3%;
- natural gas: 38.0%;
- electricity: 19.5%; and
- others: 3.2% (includes coal, manufactured fuels, biomass, etc.).

In England during 2009 the average commercial and industrial electricity usage per customer was 0.0749 GWh[2] and the average commercial and industrial gas usage per customer was 0.631 GWh.[11]

In 2008 England's net emissions of CO_2 were estimated to be 414 million tonnes, giving an estimate of 8.0 tonnes of CO_2 emissions per capita.[12]

In 2008, 29% of CO_2 emissions were from the energy supply sector, 20.3% from road transport, 31.1% from business and 24.1% from residential fossil fuel use.[13]

Scotland

The total (final) energy consumption in Scotland was 156,332 GWH in 2008. This was split between energy sources in the following proportions:

- petroleum: 41.8%;

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[8] MOD, Sustainable Development Report and Action Plan, 2009, http://www.mod.uk/NR/rdonlyres/F9E34976-9E39-4E0D-BADA-157975DF2118/0/stewardshiprpt200809v7.pdf

[9] MOD, Sustainable Development Report and Action Plan, 2008, http://www.mod.uk/NR/rdonlyres/D8407A1C-CA68-4AD4-8E17-9F71B151AF6A/0/SusDevReport2008.pdf

[10] DECC, Total Final Energy Consumption at sub-national level http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/total_final/1094-total-subnatl-final-energy-cons-2005-2008.xls&minwidth=true

[11] DECC, Sub-national authority gas consumption statistics 2005 to 2009 http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/gas/1088-subnat-gas-sales-2005-2009.xls&minwidth=true

[12] DECC Statistical Release March 2010, http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/total/total.aspx

[13] DECC http://www.decc.gov.uk/assets/decc/Statistics/climate_change/localAuthorityCO2/457-local-regional-co2-2005-2008-full-data.xls

- natural gas: 36.7%;
- electricity: 18.1%; and
- others: 3.4% (includes coal, manufactured fuels, biomass, etc.). [14]

In Scotland during 2009 the average commercial and industrial electricity usage per customer was 0.073 GWh and the average commercial and industrial gas usage per customer was 0.788 GWh. [15]

- In 2008, Scotland's net emissions of CO_2 were estimated to be 41 million tonnes and CO_2 emissions per capita were estimated at 7.9 tonnes.[4] In 2008, 33.2% of CO_2 emissions were from the energy supply sector, 26.8% from road transport, 15% from business and 33.6% from residential fossil fuel use (NB this sums to 108% as it excludes the reduction in carbon from land use changes and forestry). [16]

Wales

The total (final) energy consumption in Wales was 97,435 GWH in 2008. This was split between energy sources in the following proportions:

- petroleum: 45.4%;
- natural gas: 30.5%;
- electricity: 16.7%; and
- others: 7.4% (includes coal, manufactured fuels, biomass, etc.).

In Wales during 2009 the average commercial and industrial electricity usage per customer was 0.084 GWh and the average commercial and industrial gas usage per customer was 0.903 GWh. [17]

In 2008, Wales net emissions of CO_2 were provisionally estimated to be 32.4 average commercial and industrial gas usage per customer was 0.615,123 GWh million tonnes equating to roughly 10.8 tonnes

[14] DECC, Total Final Energy Consumption at sub-national level http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/total_final/1094-total-subnatl-final-energy-cons-2005-2008.xls&minwidth=true

[15] DECC, Sub-national authority gas consumption statistics 2005 to 2009 http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/gas/1088-subnat-gas-sales-2005-2009.xls&minwidth=true

[16] DECC, http://www.decc.gov.uk/assets/decc/Statistics/climate_change/localAuthorityCO2/457-local-regional-co2-2005-2008-full-data.xls

[17] DECC, Sub-national authority gas consumption statistics 2005 to 2009 http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/gas/1088-subnat-gas-sales-2005-2009.xls&minwidth=true

per capita.[18] CO_2 accounts for around 75.2% of total Wales greenhouse gas emissions.[5] In 2008, 25% of CO_2 emissions were from the energy supply sector, 20.3% from road transport, 31.1% from business and 24.1% from residential fossil fuel use.Error! Bookmark not defined.

In 2007 Wales emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were provisionally estimated to be 39 million tonnes CO_2 equivalent. This was 7% lower than the 2006 figure.

Northern Ireland

The total (final) energy consumption in Northern Ireland was 38,386 GWH in 2007.[19] This was split between energy sources in the following proportions:

- petroleum: 92.7%; and
- others: 7.3% (includes coal, manufactured fuels, biomass, etc.).[20]

In Northern Ireland during 2007 the average commercial and industrial electricity usage per customer was 0.079077 GWh whereas the average commercial and industrial gas usage per customer: 0.63377900 GWh[2]

In 2008/09, 596 MWh of electricity in Northern Ireland was produced from renewable sources. This was equivalent to 7.3% of the total electricity consumption in that period.

There has been a sizable increase in the amount of electricity produced from renewable sources since 2000/01, when only 118MWh (1.4% of total electricity consumed) was renewable.

In 2008, Northern Ireland net emissions of CO_2 were provisionally estimated to be 16.2 million tonnes [19]. CO_2 accounts for around 85% of total UK greenhouse gas emissions.[3] In 2009, 18.5% of CO_2 emissions were from the energy supply sector, 31.1% from road transport, 15.4% from business and 35.5% from residential fossil fuel use.[19]

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[18] DECC, http://www.decc.gov.uk/assets/decc/Statistics/climate_change/localAuthorityCO2/457-local-regional-co2-2005-2008-full-data.xls
[19] http://www.decc.gov.uk/assets/decc/Statistics/climate_change/localAuthorityCO2/457-local-regional-co2-2005-2008-full-data.xls
[20] DECC, Total Final Energy Consumption at sub-national level http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/total_final/1094-total-subnatl-final-energy-cons-2005-2008.xls&minwidth=true

8.3.2 Sub-regional locations

Plymouth

The total energy consumption in Plymouth in 2008 was 4,539 GWh. This has reduced from the 2007 figure of 4,941 GWh. Of this, 35% was consumed by the industrial/commercial sector; 38% by the domestic sector; and 27% by transport. This figure was split between energy sources: 41% natural gas; 33% petroleum products; 25% electricity; 0.3% coal; and 0.2% renewables.[21]

In 2009, the average commercial and industrial electrical consumption per customer in Plymouth was significantly higher than the South West and national averages (0.0833 GWh in Plymouth compared to 0.0578 GWh in the South West and 0.0763 GWh in Great Britain).[22]

In 2009, the average commercial and industrial gas consumption per customer in Plymouth was higher than the South West average but less than the national average (0.592 GWh in Plymouth compared to 0.546 GWh in the South West and 0.634GWh in Great Britain).[23]

In 2008, road transport in Plymouth used 93,000 tonnes of fuel – a drop from the previous 3 year average of 96,500 tonnes. Of this, 76% was used for personal transport (including buses), and 24% was attributable to road freight.[22]

In 2008, Plymouth produced a total of 1,401 kt CO_2. 41% of CO_2 emissions were attributed to commercial and industrial activities.[24]

Total end user CO_2 emissions per capita (tonnes CO_2 per resident) in 2008 were 5.5 tonnes per resident (compared to a national average of 7.4 tonnes per resident).[24]

Temperature records kept at Plymouth show a warming of 0.5°C over the last 25 years. Plymouth's rainfall records show an increased trend since the drought of 1975/76, although there were also periods of increasing rainfall at the start of the Century and in the 1920s. Despite the increasingly warm

[21] Department of Energy and Climate Change (2010) Total final energy consumption at regional and local authority level), http://www.decc.gov.uk/en/content/cms/statistics/regional/total_final/total_final.aspx.
[22] Department of Energy and Climate Change (2010) Total final energy consumption at regional and local authority level), http://www.decc.gov.uk/en/content/cms/statistics/regional/total_final/total_final.aspx.
[23] DECC (2010) Sub-national gas sales and numbers of customers http://www.decc.gov.uk/publications/basket.aspx?filetype=4&filepath=Statistics%2fregional%2fgas%2f1088-subnat-gas-sales-2005-2009.xls&minwidth=true#basket
[24] DECC, NI 186 - Per capita reduction in CO2 emissions in the LA area, 2008, http://www.decc.gov.uk/assets/decc/Statistics/climate_change/localAuthorityCO2/460-ni186-per-capita-co2-emissions.xls

conditions, the winter of 2006 was cooler than average. The summer of 1995 was the driest on record with only 5.3mm of rainfall and the winter of 1993/94 was the wettest on record with 547mm of rainfall.[25]

Plymouth is in a good geographical position to utilise solar, wave, tidal, biomass and wind energies. However, currently Plymouth has no significant renewable energy facilities (Plymouth's total renewable energy production in 2006 was only 5.8MWe).[26]

Fife

The total energy consumption in Fyfe in 2007 was 13,397.4 GWh. This was comprised of 7,110.3 GWh for the industrial/commercial sector, 3779.7 GWh for the domestic sector and 2507.4 GWh for the transport sector.[27] This was split between energy sources as follows: 50% natural gas; 32% petroleum products; 13% electricity; 5% coal; and 0.22% renewables and waste. [27]

In 2007 Fife total energy consumption per capita was higher than the Scottish average, but lower than the national totals (37,300 kWh in Fife compared to 30,900 kWh in the Scotland and 28,000 kWh in Great Britain).[27]

In 2009, the average commercial and industrial electrical consumption per customer in Fife was similar to Scottish and UK averages (0.0739 GWh in Fife compared to 0.0730 GWh in the Scotland and 0.0763 GWh in Great Britain).[28]

In 2009, the average commercial and industrial gas consumption per customer in Plymouth was siginificantly higher than the Scottish and UK averages (1.302 GWh in Fife compared to 0.788 GWh in Scotland and 0.634GWh in Great Britain). [29]

In 2008 road transport in Fife used 182,000 tonnes of fuel. Of this 67.91% was attributable to movement of people and 32.09% was attributable to movement of freight. [27]

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[25] Action on Climate Change. The First Steps 2009-2011, Plymouths Climate Change Action Plan, http://www.plymouth.gov.uk/acting_on_climate_change.pdf

[26]Plymouth Renewable Energy, Strategic Viability Study 2007 http://www.plymouth.gov.uk/070416_plymouth_renewables_study_-_final_version_march_2007-2.pdf

[27] Department of Energy and Climate Change (2010) *Total final energy consumption at regional and local authority level (Regional Energy Consumption Statistics 2007)* , http://www.decc.gov.uk/en/content/cms/statistics/regional/regional.aspx; and Department of Business, Enterprise and Regulatory Reform (BERR) Energy Consumption at Regional and Local Authority Level, 2008 http://www.berr.gov.uk/energy/statistics/regional/index.html

[28] Department of Energy and Climate Change (2010) Total final energy consumption at regional and local authority level), http://www.decc.gov.uk/en/content/cms/statistics/regional/total_final/total_final.aspx.

[29] DECC (2010) Sub-national gas sales and numbers of customers http://www.decc.gov.uk/publications/basket.aspx?filetype=4&filepath=Statistics%2fregional%2fgas%2f1088-subnat-gas-sales-2005-2009.xls&minwidth=true#basket

In 2007, Fife produced a total of 3,587 kt CO_2. 50.2% of CO_2 emissions were attributed to commercial and industrial activities (45.4% nationally). [30]

Total end user CO_2 emissions per capita (tonnes CO_2 per resident) in 2007 were 9.9 tonnes per capita (compared to a national average of 8.4 tonnes per resident). [30]

8.4 Existing problems

8.4.1 National

UK

The main source for determining how the climate of the UK may change is the UK Climate Impacts Programme scenarios, published in 2009 and known as UKCP09. The UKCP09 findings indicate that all areas of the UK are getting warmer, and the warming is greater in summer than in winter. There is little change in the amount of precipitation (rain, hail, snow etc) that falls annually, but more is falling in the winter, with drier summers, for much of the UK. Sea levels are rising, and are greater in the south of the UK than the north. [31]

The UK is experiencing sea level rise of approximately 1mm per year. Global sea-level is rising at about 3mm per year.[32] Central England's temperature has risen by about 0.7 ºC over the last century, with 2004 being the warmest on record. [33] Sea-surface temperatures around the UK coast have risen over the past three decades by about 0.7 ºC. Global average temperatures are rising at about 0.2 ºC per decade. Severe windstorms around the UK have become more frequent in the past few decades, though not above that seen in the 1920s. Annual mean precipitation over England and Wales has not changed significantly since records began; however seasonal rainfall appears to be decreasing in summer and increasing in winter.[32]

Key climate change include that the UK climate is warming and becoming more seasonal; climate changes are more pronounced in south east of the UK compared to the north west; sea levels are rising, and UK greenhouse gas emissions are falling with a target of an 80% cut in emissions by 2050 (compared to 1990 levels).

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[30] Local and Regional CO2 Emissions Estimates for 2005-2007 http://www.decc.gov.uk/en/content/cms/statistics/climate_change/gg_emissions/uk_emissions/2007_local/2007_local.aspx

[31] DECC (2007) http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/loc_reg_dev/ni185_186/ni185_186.aspx

[32] Defra, Environment in your Pocket Statistics, 2009, http://www.defra.gov.uk/evidence/statistics/environment/eiyp/

[33] MOD, Sustainable Development Report and Action Plan, 2009, http://www.mod.uk/NR/rdonlyres/F9E34976-9E39-4E0D-BADA-157975DF2118/0/stewardshiprpt200809v7.pdf

8.4.2 Sub-regional locations

Plymouth

In Plymouth, higher summer temperatures are becoming more frequent, and winters are getting wetter. This will have a wide range of consequences – from changes in flood risks from rivers and the sea, to the introduction of new species and health implications from sunlight or food hygiene issues.[34]

Fife

Fife is susceptible to heavy rainfall and flooding; 58.1 Km^2 or 4.4% of Fife is said to be at a high risk of flooding. Putting this into a human environment perspective 4,036 properties are within this high risk area.[35]

8.5 Likely evolution of the baseline

8.5.1 National

UK

The current trend in energy use is generally towards increased consumption; however, there have been some slight declines in recent years associated with mild winters. Since 1980, UK energy consumption by individual sectors has changed substantially: there have been rises of 68% for transport, 10% for the domestic sector and 3% for the service sector, whilst consumption by industry has fallen by 34%.

However, in recent years there has been an overall decrease in the total energy consumed on a national level. In UK in 2008 total energy use had decreased by 7.6% to 1,604618 GWH compared to 2005 levels of 1,738,031 GWH.[36]

There has been a steady decrease in the 6 greenhouses gases of the Kyoto basket since 1990. In 2009 566.3 million tonnes of CO2 equivalent were emitted from the UK, which was a 27.2% decrease compared to volumes emitted in 1990 and a 8.2% decrease compared to values in 2008. However,

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[34] Action on Climate Change. The First Steps 2009-2011, Plymouths Climate Change Action Plan, http://www.plymouth.gov.uk/acting_on_climate_change.pdf

[35] Fife Council (2010), Local Climate Change Impact Profile, http://www.fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=42CB9767-9426-52CD-5C42FF1C2A5392E7

[36] DECC, Total Final Energy Consumption at sub-national level http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/total_final/1094-total-subnatl-final-energy-cons-2005-2008.xls&minwidth=true

provisional results for 2010 estimate 582.4 million tonnes of CO2 equivalent were emitted giving an increase of 2.8% compared to 2009 values.[37]

UKCP09 provides the following prediction on changes to climate within the UK based on the medium emission scenario with 90% probability:[38]

- **2080 mean winter temperature**: the central estimates of change are projected to be generally between 2 and 3ºC across most of the country, with slightly larger changes in the south east and slightly smaller in the north west of Britain;
- **2080 mean summer temperature**: a more pronounced south to north gradient exists with changes in some parts of southern England being just over 4ºC and in parts of northern Scotland about 2.5ºC;
- **2080 mean summer daily maximum temperature**: central estimates show a gradient between parts of southern England, where they can be 5ºC or more, and northern Scotland, where they can be somewhat less than 3ºC;
- **2080 mean annual precipitation**: shows little change (few percent or zero);
- **2080 mean winter precipitation:** increases are in the range +10 to +30% over the majority of the country. Increases are smaller than this in some parts of the country, generally on higher ground;
- **2080 mean summer precipitation**: general south to north gradient, from decreases of almost 40% in SW England to almost no change in Shetland;
- The range of absolute sea level rise around the UK (before land movements are included) and across the three emissions scenarios is projected to be between 12 and 76 cm for the period 1990–2095, which is a wider spread than that of the global average;
- The projected long-term future trends in storm surge that we find in UKCP09 are physically small everywhere around the UK, and in many places can be accounted for by natural variability. The surge level we expect to be exceeded on average once in 2, 10, 20 or 50 yr is not projected to increase by more than 9 cm by 2100 anywhere around the UK coast (not including the mean sea level change). The largest trends are found in

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[37] DECC (2011) 2010 Provisional GHG emissions http://www.decc.gov.uk/publications/basket.aspx?filetype=4&filepath=Statistics%2fclimate_change%2f1514-ghg-emissions-provisional-2010.xls&minwidth=true#basket

[38] UKCP09 http://ukclimateprojections.defra.gov.uk/content/view/515/499/

the Bristol Channel and Severn Estuary; and

- Seasonal mean and extreme waves are generally expected to increase to the South West of the UK, reduce to the north of the UK and experience a small change in the southern North Sea. Changes in the winter mean wave height are projected to be between –35 and +5 cm. Changes in the annual maxima are projected to be between –1.5 and +1 m.

The Climate Change Act 2008 was passed in November 2008 and creates a new approach to managing and responding to climate change in the UK. This includes putting in place legally binding targets with the aim of reducing emissions by at least 80% by 2050 (compared to 1990 levels) and a set of five-year carbon budgets (legally binding limits on the total quantity of greenhouse gas emissions that the country produces over a 5 year period) to 2022. Included within the Fourth Carbon Budget the Committee on Climate Change is the recommendation for an indicative 2030 target to reduce emissions by 60% relative to 1990 levels (46% relative to 2009 levels).[39]

In response, the White Paper 'The UK Low Transition Plan' sets out the UK's first comprehensive low carbon transition plan to 2020. Carbon Reduction Commitments and individual company budgets will ensure that large energy users gradually reduce their carbon footprints, or have to purchase credits through the European Emissions Trading Scheme. Emissions reductions are expected to be achieved initially within 5 Sectors (power and heavy industry; transport, homes and communities; workplaces and jobs; farming, land and waste). DECC aims to put the UK on a path to a low carbon UK by cutting CO_2 emissions; investing in energy efficient and clean technologies, maintain secure energy supplies; and protecting the most vulnerable.[40] The UK is committed to delivering 20% of its energy from renewable sources by 2020. [40, 41] There are plans for a new generation of nuclear power stations in the UK. [1] DECC aims for no homes to be in fuel poverty by 2016-2018.[40]

England

In 2008 England's emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were provisionally estimated to be 503.2 million tonnes CO_2 equivalent which is a 26.3% decrease compared to emissions in 1990.[42]

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[39] Committee on Climate Change (2010) Fourth Carbon Budget, http://www.theccc.org.uk/reports/fourth-carbon-budget
[40] DECC, The UK Low Carbon Transition Plan: National Strategy for Climate and Energy, http://www.decc.gov.uk/assets/decc/white%20papers/uk%20low%20carbon%20transition%20plan%20wp09/1_20090909102052_e_@@_nationalstrategyclimateenergy.pdf
[41] Energy Challenge, A White Paper on Nuclear Power, January 2008, http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file43006.pdf
[42] National Atmospheric Emissions Inventory , Devolved Administration End User GHG Emissions Data http://www.airquality.co.uk/archive/reports/cat07/1009071019_DA_EndUsers_1990-2008_Issue_1.xls

Total energy consumption in England has been decreasing in recent years. In 2008 total energy consumption was 1,313,341 GWH; a 8.1% decrease compared to 2005 value of 1,429,495 GWH.[43]

UKCP09 provides the following changes in climate for England in 2080 based on a medium emission scenario with 90% probability:[44]

- **2080 mean winter temperature**: a change in temperature from 4.0ºC in the Northwest to 4.7ºC in the South and East of England.
- **2080 mean summer temperature**: a change in temperature from 5.4ºC in Yorkshire to 6.5ºC in the South East.
- **2080 mean winter precipitation:** increases are in the range 41% in the East Midlands to 54% in the South West; and
- **2080 mean summer precipitation**: no change is expected in Yorkshire to a 7% increase in the South East and London.

England shares the same targets related to climate change and energy use as the rest of the UK. Although there are additional targets on a regional and local authority level contained within strategies there are too many to mention for the purposes of this report.

Scotland

In 2008 Scotland's emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were provisionally estimated to be 54.5 million tonnes CO_2 equivalent which is a 26.3% decrease compared to emissions in 1990.[45]

Scotland's energy consumption in 2008 was 156,332 GWH which was a decrease of 4.8% compared to an energy consumption of 164,274 GWH in 2005.[43]

UKCP09 provides the following predictions on changes in climate for Scotland in 2080 based on a medium emission scenario with 90% probability:[46]

- **2080 mean winter temperature**: a change in temperature from 3.6ºC to 4.0ºC;

[43] DECC, Total Final Energy Consumption at sub-national level http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=Statistics/regional/total_final/1094-total-subnatl-final-energy-cons-2005-2008.xls&minwidth=true
[44] UKCP09 http://ukclimateprojections.defra.gov.uk/content/view/515/499/
[45] National Atmospheric Emissions Inventory , Devolved Administration End User GHG Emissions Data http://www.airquality.co.uk/archive/reports/cat07/1009071019_DA_EndUsers_1990-2008_Issue_1.xls
[46] UKCP09 http://ukclimateprojections.defra.gov.uk/content/view/515/499/

- **2080 mean summer temperature**: a change in temperature from 4.9ºC to 5.7ºC;
- **2080 mean winter precipitation:** increases are in the range 25% to 42%; and
- **2080 mean summer precipitation**: increases are in the range 1-4%.

Scotland has set a clear path to achieving its target of reducing emissions by 42% by 2020. Annual targets have been set for 2011- 2022. [47]

The Scottish Executive set targets in 2007 that 18% of electricity generated in Scotland should come from renewable sources by 2010 rising to 40% by 2020.[48]

Scotland's existing target was established in 2007 and, aided by a rapid expansion in wind power, the country is on course to exceed its interim target of 31% in 2011. The Scottish Government has now calculated that significantly higher levels of renewables could be deployed by 2020 with little change to the current policy, planning or regulation framework in Scotland now 80% of Scottish electricity consumption to come from renewables by 2020.[49]

The 2020 Climate Change Act establishes an interim target for 2020 of at least 42% reductions in emissions.[50]

Wales

In 2008 Wales' emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were provisionally estimated to be 42.7 million tonnes CO_2 equivalent which is a 20.9% decrease compared to emissions in 1990.[51]

Wales' energy consumption in 2008 was 97,435 GWH which was a decrease of 7.7% compared to an energy consumption of 105,645 GWH in 2005. [43]

UKCP09 provides the following predictions on changes in climate in Wales for 2080 based on medium emission scenario with 90% probability:[52]

- **2080 mean winter temperature**: a change in temperature of 4.2ºC;

[47] Scottish Government Website news, http://www.scotland.gov.uk/News/Releases/2010/09/22133935
[48] Scottish Government website, http://www.scotland.gov.uk/Resource/Doc/54357/0013233.pdf
[49] The Scottish Government Website, http://www.scotland.gov.uk/News/Releases/2010/09/23134359
[50] The Scottish Government Website, http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact/targets
[51] National Atmospheric Emissions Inventory , Devolved Administration End User GHG Emissions Data http://www.airquality.co.uk/archive/reports/cat07/1009071019_DA_EndUsers_1990-2008_Issue_1.xls
[52] UKCP09 http://ukclimateprojections.defra.gov.uk/content/view/515/499/

- **2080 mean summer temperature**: a change in temperature of 5.8ºC;
- **2080 mean winter precipitation:** increases of 42%; and
- **2080 mean summer precipitation**: increases of 5%.

One Wales: A Progressive Agenda for Wales, commits to annual reductions in greenhouse gas emissions of 3% per year in areas of devolved competence by 2011. This target:

- relates to the “basket” of six greenhouse gases - CO_2, methane, nitrous oxide, hydroflourocarbons, perflourocarbons and sulphur hexafluoride; and
- includes all ‘direct’ greenhouse gas emissions in Wales (except those from heavy industry and power generation) and it also includes the emissions associated with electricity consumption, allocated to end-users in Wales.

Consequently, the 3% target covers approximately 69% of total greenhouse gas emissions in Wales.

To measure the target, Wales will compare the relevant emissions in each year from 2011 onwards to a baseline. This baseline will be an average of the relevant emissions between 2006 and 2010. Beginning with a 3% reduction in 2011, the target is to reduce greenhouse gas emissions by an additional 3% of the baseline in each year.

Wales are also committed to achieving at least a 40% reduction in all greenhouse gas emissions by 2020 against a 1990 baseline.

Northern Ireland

In 2008 Wales’ emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were provisionally estimated to be 22.9 million tonnes CO_2 equivalent which is a 11.1% decrease compared to emissions in 1990.[53]

Northern Ireland’s energy consumption in 2008 was 37,509 GWH which was a decrease of 2.8% compared to an energy consumption of 38,617 GWH in 2005. [43]

UKCP09 provides the following medium emission scenario with 90% probability:[54]

- **2080 mean winter temperature**: a change in temperature of 3.6ºC;

[53] National Atmospheric Emissions Inventory , Devolved Administration End User GHG Emissions Data http://www.airquality.co.uk/archive/reports/cat07/1009071019_DA_EndUsers_1990-2008_Issue_1.xls
[54] UKCP09 http://ukclimateprojections.defra.gov.uk/content/view/515/499/

- **2080 mean summer temperature**: a change in temperature of 5ºC;
- **2080 mean winter precipitation:** increases of 24%; and
- **2080 mean summer precipitation**: increases of 3%.

In January 2008, Office of the First Minister and Deputy First Minister published the 2008 - 2011 Programme for Government which set a target for a 25% decrease in Northern Irelands total greenhouse gas emissions by 2025. [55]

The Northern Ireland Renewables Obligation, published in October 2004, sets a target that by 2012, 12% of all electricity consumed in Northern Ireland is generated from indigenous renewable sources, for example wind farms.[56]

8.5.2 Sub-regional locations

Plymouth

Between 2005 and 2007 average commercial and industrial gas usage per customer increased from 595,016 KWh to 744,810 KWh. Between 2005 and 2007 average commercial and industrial electricity usage per customer decreased from 92,370 KWh to 89,440 KWh. Between 2005 and 2006 total commercial and industrial energy usage decreased from 1,730.9 GWh to 1,701.5 GWh.[57]

The UK's Climate Projections (UKCP09) shows that the South West region is likely to experience hotter drier summers, warmer wetter winters and rising sea levels. This is likely to have a significant effect on environmental conditions and will increase the impact of human activity on the water environment. [58]

The key trend findings of 2080s medium emissions scenario for South West England are as follows:[59]

- an increase in winter mean temperature of 2.8ºC; it is very unlikely to be less than 1.6ºC and is very unlikely to be more than 4.3ºC;
- an increase in summer mean temperature of 3.9ºC; it is very unlikely to be less than 2.1ºC and is very unlikely to be more than 6.4ºC;

[55] http://www.doeni.gov.uk/index/protect_the_environment/climate_change.ht%20m
[56] http://www.detini.gov.uk/deti-energy-index/deti-energy-sustainable/northern_ireland_renewables_obligation_.htm
[57] Department of Energy and Climate Change (2009) *Total final energy consumption at regional and local authority level (Regional Energy Consumption Statistics 2006)* , http://www.decc.gov.uk/en/content/cms/statistics/regional/regional.aspx
[58] http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/southwest/Intro.aspx
[59] Defra, UKCP09, http://ukcp09.defra.gov.uk/content/view/20/6

- a change in winter mean precipitation of 23%; it is very unlikely to be less than 6% and is very unlikely to be more than 54%; and
- a change in summer mean precipitation of -23%; it is very unlikely to be less than -49% and is very unlikely to be more than 6%.

Plymouth City Council aims to reduce Plymouth's overall carbon footprint by 20% by 2013, 60% by 2020 and 80% by 2050. [60]

Plymouth City Council aims: [61]

- that all proposals for non-residential developments exceeding 1,000 square metres of gross floorspace, and new residential developments comprising 10 or more units (whether new build or conversion) to incorporate onsite renewable energy production equipment to off-set at least 10% of predicted carbon emissions for the period up to 2010, rising to 15% for the period 2010-2016; and
- to ensure building design reduces energy consumption by appropriate methods such as high standards of insulation, avoiding development in areas subject to significant effects from shadow, wind and frost, using natural lighting and ventilation, capturing the sun's heat, where appropriate.

Fife

Fife is expected to become warmer and wetter in the winter, with hotter and drier summers. Though difficult to predict, extreme weather events such as localised heavy rainfall are likely. This will mean more: flooding, mudslides, land subsidence, infrastructure damage and pests like midges surviving through milder winters.[62]

Key findings for Scotland East for 2080s medium emissions scenario include: [63]

- the trend is for an increase in winter mean temperature of 2.2ºC; it is very unlikely to be less than 1.0ºC and is very unlikely to be more than 3.7ºC;

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[60] Source: Plymouth City Council, Climate Change Framework 2008-2020 http://www.plymouth.gov.uk/climate_change_strategy.pdf
[61] Plymouth CC, Core Strategy Development Plan Document - Policy CS20
[62] Fife Council, Climate Change, Carbon and Energy, http://www.fife.gov.uk/topics/index.cfm?fuseaction=page.display&pageid=E2A8E526-65BF-00F7-DA6238F1EB3894F6&subjectid=430EB347-005B-8681-1629D8206303D4C8
[63] Defra, UKCP09, http://ukcp09.defra.gov.uk/content/view/20/6

- the trend is for an increase in summer mean temperature of 3.5ºC; it is very unlikely to be less than 1.8ºC and is very unlikely to be more than 5.7ºC;
- the trend is for a change in winter mean precipitation of 0%; it is very unlikely to be less than -6% and is very unlikely to be more than 6%;
- the trend is for a change in summer mean precipitation of -17%; it is very unlikely to be less than –33% and is very unlikely to be more than 0%;
- between 2005 and 2007 average commercial and industrial gas usage per customer increased from 1,439,961 KWh to 1,845,037 KWh;
- between 2005 and 2007 average commercial and industrial electricity usage per customer decreased from 88,409 KWh to 78,124 KWh; and
- between 2005 and 200 total commercial and industrial energy usage increased from 5,910.6 GWh to 7,110.3 GWh.[64]

There is likely to be a trend of increasing energy demand. However, an increasing proportion of energy is likely to be generated from renewable sources.[65]

Targets within the Fife Structure Plan include:

- to reduce the cause and effects of climate change;
- to reduce greenhouse gas emissions; and
- to reduce vulnerability to the effects of climate change e.g. flooding, disruption to travel by extreme weather, etc.[66]

8.6 Assessment objective, guide questions and significance

The objective and guide questions related to climate change and energy use that have been used in the assessment of the effects of the SDP are set out in Table 8.1, together with reasons for their selection

[64] Department of Business, Enterprise and Regulatory Reform (BERR) Energy Consumption at Regional and Local Authority Level, 2007 http://www.berr.gov.uk/energy/statistics/regional/index.html

[65] Fife Council, Fife Structure Plan SEA 2008, http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/dev-plan/FifeSP/FifeSEAreport

[66] Fife Council, Fife Structure Plan 2006 - 2026 Post Adoption SEA 2010, http://www.fifedirect.org.uk/uploadfiles/publications/c64_PostAdoption-FinalisedPostAdoptionSEAStatement-January20101.pdf

Table 8.1 Approach to assessing the effects of SDP on climate change and energy use

Objective/guide question	Reasoning
Objective: Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.	The SEA Directive requires that the likely significant effects on climate change should be taken into account in the Environmental Report.
Will the SDP proposals affect the amount of carbon dioxide and other greenhouse gases emitted?	SDP needs to demonstrate consideration of the effects of the Climate Change Act 2008 in terms of decreasing greenhouse gas emissions compared to present, including both direct and indirect emissions.
Will the SDP proposals be significantly affected by climate change (for example rising temperatures and more extreme weather events)?	UKCP09 scenarios show that increasing temperatures and changes to precipitation, increased storminess and extreme weather is expected, which has the potential to impact on SDP proposals.
Will the SDP proposals affect how climate change might impact on the wider environment?	Given the scale of the proposals there is the potential that SDP could have implications on the resilience/vulnerability of the wider environment to changes in climate.
Will the SDP proposals promote or impede the use of energy efficiency measures, low carbon and/ or renewable energy sources?	The CRC Energy Efficiency Scheme promote energy efficiency and low carbon. The Renewable Strategy includes target to increase renewable energy to 15% of all energy used in UK by 2020.
Will the SDP proposals have wider implications for combating the effects of climate change?	Given the scale of the proposals there is the potential that energy used in undertaking the proposals may have wider implications in terms of meeting greenhouse gases and energy targets.

Table 8.2 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the climate change and energy use objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 8.2 Approach to determining the significance of effects on climate change and energy use

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option would significantly improve energy efficiency of site activities (reducing site useage by at least 15% year on year) • Option would significantly reduce carbon footprint of site (by >20% by 2020 compared to 2010) • Option will increase resilience/decrease vulnerability to climate change in the wider environment.
+	Positive	• Option would improve energy efficiency of site activities (reducing site useage by less than 15% year on year) • Option would reduce carbon footprint of site (by <20% by 2020 compared to 2010) • Option may increase resilience/decrease vulnerability to climate change in the wider environment

Effect	Description	Illustrative Guidance
0	No (neutral effects)	• Option would not lead to an overall change in energy consumption/efficiency, greenhouse gas emissions in a way that will not contribute to climate change or resilience to climate change within the wider environment.
-	Negative	• Option would decrease energy efficiency of site activities (increasing site useage by less than 15% year on year) • Option would increase carbon footprint of site (by <20% by 2020 compared to 2010) • Option may decrease resilience/increase vulnerability to climate change in the wider environment • Location of mitigated option may be affected by coastal inundation or sea level rise.
--	Significant negative	• Option would decrease energy efficiency of site activities (increasing site useage by more than 15% year on year) • Option would increase carbon footprint of site (by >20% by 2020 compared to 2010) • Option will decrease resilience/increase vulnerability to climate change in the wider environment • Location of mitigated option will be significantly affected by coastal inundation or sea level rise.
?	Uncertain	• From the level of information available the impact that the option would have on this objective is uncertain.

8.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the climate change and energy use objective. Table 8.3 provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 8.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.
Stage VII	• Decommissioning the facilities and reinstating the site(s) to their previous land quality:

Key Stages	The SEA will assess the effects of…
Decommission SDP facilities	– undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 8.4** below.

Table 8.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than 'greenfield' sites, although it is recognised that 'brownfield' land can be important for conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries)

Category	Assumption Description
	will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m$^{2.}$ Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2. As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average). • It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine • It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).

Category	Assumption Description
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since breaking a cleared submarine is little different to breaking a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be transported from the initial dismantling facility to the interim storage facility by sea, rail or road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the

Category	Assumption Description
	proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Table 8.3** are considered in-turn below.

Stage I: Designing & Develop Initial Submarine Dismantling Facilities

Climate Change and Energy Use

Option 1: Develop a Greenfield Site for Submarine Dismantling

Assessment of Effects:

The construction of the SDP facilities and ancillary infrastructure on a greenfield site could result in significant effects on the climate change and energy use objective.

Due to the need for the site to be in a coastal location, the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Any choice of location for the SDP facilities must therefore consider the identified sea level changes and the increased frequency of extreme weather conditions. Climate change effects such as intensified weather events have the potential to affect the development of SDP sites. Such effects may result in damage to facilities or disruption of construction activity. The construction of the facilities may also affect neighbouring coastal areas due to changes in coastal resilience.

The emission of CO2 (due to the direct or indirect combustion of fossil fuel) from construction traffic and plant, any use of diesel generators, and the embodied energy within construction materials used would contribute to climate change.

When considering the source of the construction material used, the distance and method of transportation would have a direct effect on overall carbon emissions (for example the different emissions associated with transport by road, rail or ship). The magnitude of effects will depend on the size of the development, the type of materials used, the transport mode and the distance travelled. In this case, the construction of the facilities and ancillary infrastructure is assumed to use material with high embodied carbon values, such as concrete and steel with the potential for the movement of the majority of the materials to be by sea. Opportunities through facility design, construction and subsequent operation should be taken to ensure that energy efficiency is optimised and low carbon energy sources used preferentially throughout the project lifecycle.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities and infrastructure (e.g. roads, car parking, security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale of construction would be reduced under RC/RPV storage options in the short term, it can be assumed that CO2 emissions would also be less (due to a requirement for fewer materials and a reduction in construction traffic and the use of plant equipment) relative to PW storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities and a delay in construction (by approximately 25 years) may mean that the potential effects of climate change (coastal inundation and the increased frequency of more intensive weather events) are more likely to affect activities.

Proposed Mitigation / Enhancements Measures:

- All buildings on site should be designed to the highest standards of energy efficiency, meeting or exceeding future Building Standards requirements, and should be well adapted to future climate. Designing in low carbon energy provision and energy efficiency is more cost effective than retrofitting solutions at a later date and is therefore recommended. Similarly, limiting the need to artificially cool buildings, through good design, is recommended. Consider meeting DREAM excellent requirements.
- Ensure that FRA informs site suitability prior to development.
- Where practicable, provision should be made for the transport of construction materials and construction wastes via rail or sea.
- Consider the use of dredging/excavation materials in the construction of the facility and ancillary uses/infrastructure
- Measures to reduce private vehicle use for travel to/from work and transport distances should also be implemented.
- Where possible, construction materials with lower embodied energies should be utilised. When considering the detail of design and within

Stage I: Designing & Develop Initial Submarine Dismantling Facilities

Climate Change and Energy Use

engineering appraisal, the carbon associated with construction materials should be considered, for example its source, distance to be transported, method of transport and volume. Where reasonable lower carbon alternatives are available they should be considered.

- Construction waste generation on site should be minimised (where transport off-site would be required) in order to limit carbon emissions associated with this additional transport requirement.
- Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators. The potential for renewable energy generation (e.g. solar panels, dedicated wind turbines, ground source heat pumps or biomass boilers) to meet energy needs on site should be considered..

Summary:	
Option 1 has been assessed as having a potentially significant negative effect in relation to this objective, due to the impact of extensive construction and associated activities required to provide the dismantling and size reduction facilities and all ancillary uses/infrastructure. This is further exacerbated by the greenhouse gas emissions associated with the transport of significant quantities of construction materials to the site (although this can be mitigated through the use of sea or rail transport in preference to road). Due to the need for the site to be in a coastal location, the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. The construction of the facilities may also affect neighbouring coastal areas due to changes in erosion and sediment deposition rates. For RC and RPV storage options construction of the size reduction facility would be delayed. This may reduce CO_2 emissions associated with construction activities and HGV movements in the short term relative to the PW storage option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling and a delay in construction (by approximately 25 years) may mean that the potential effects of climate change (coastal inundation and the increased frequency of more intensive weather events) are more likely to affect activities.	**--**

Option 2: Develop Brownfield Site for Submarine Dismantling

Assessment of Effects:

The construction of the SDP facilities and ancillary infrastructure on a brownfield site could result in effects on the climate change and energy use objective. Under Option 2, previously developed land would be utilised and it is anticipated that there is sufficient existing infrastructure in place (such as docks to accommodate submarines) to support the operation of the dismantling and size reduction facilities.

Due to the need for the site to be in a coastal location, the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Any choice of location for the SDP facilities must therefore consider the identified sea level changes and the increased frequency of extreme weather conditions. Climate change effects such as intensified weather events have the potential to affect the development of the site. Such effects may result in damage to facilities or disruption of construction activity. The construction of the facilities may also affect neighbouring coastal areas due to changes in coastal resilience.

The emission of CO_2 (due to the direct or indirect combustion of fossil fuel) from construction traffic and plant, any use of diesel generators, and the embodied energy within construction materials used would contribute to climate change although this is expected to be less than identified within Option 1 due to reductions in scale of anticipated construction and redevelopment due to previous uses of the brownfield site.

When considering the source of the construction material used, the distance and method of transportation would have a direct effect on overall carbon emissions (for example the different emissions associated with transport by road, rail or ship). The magnitude of effects will depend on the size of the development, the type of materials used, the transport mode and the distance travelled. In this case, the construction of the facilities and ancillary infrastructure is assumed to use material with high embodied carbon values, such as concrete and steel with the potential for the movement of the majority of the materials to be by sea. Opportunities through facility design, construction and subsequent operation should be taken to ensure that energy efficiency is optimised and low carbon energy sources used preferentially throughout the project lifecycle.

Although there is anticipated to be reduced emissions of greenhouse gases within Option 2 than in Option 1, there are still likely to be opportunities to promote the use of energy efficiency measures and low carbon and/or energy sources within the construction and development

Stage I: Designing & Develop Initial Submarine Dismantling Facilities Climate Change and Energy Use	
of the site. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on a brownfield site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities (e.g. security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage. As the scale of construction would be reduced under RC/RPV storage options in the short term, it can be assumed that CO2 emissions would also be less (due to a requirement for fewer materials and a reduction in construction traffic and the use of plant equipment) relative to PW storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities and a delay in construction (by approximately 25 years) may mean that the potential effects of climate change (coastal inundation and the increased frequency of more intensive weather events) are more likely to affect activities. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a negative effect in relation to this objective. This is primarily due to the fact that whilst the majority of ancillary infrastructure will be in place, some remaining infrastructure and the dismantling/size reduction facilities will still need to be constructed. The emission of CO2 (due to the direct or indirect combustion of fossil fuel) from staff traffic, construction plant, transport emissions associated with moving construction materials will contribute negatively to this objective. In addition, the embodied energy associated with the construction materials used would also have an indirect negative effect on the objective. Due to the need for the site to be in a coastal location there is a risk that the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. For RC and RPV storage options construction of the size reduction facility would be delayed. This may reduce CO2 emissions associated with construction activities and HGV movements in the short term relative to the PW storage option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling and a delay in construction (by approximately 25 years) may mean that the potential effects of climate change (coastal inundation and the increased frequency of more intensive weather events) are more likely to affect activities.	-
Option 3: Develop Licensed/Authorised Site for Submarine Dismantling	
Assessment of Effects: Option 3, an existing Licensed/Authorised site would be utilised and it is anticipated that there is sufficient existing infrastructure in place (such as docks to accommodate submarines) to support the operation of the facilities thus reducing the amount of carbon dioxide and other greenhouse gases emitted during construction activities further than that identified within option 1 and potentially within option 2. Due to the need for the site to be in a coastal location, the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Any choice of location for the SDP facilities must therefore consider the identified sea level changes and the increased frequency of extreme weather conditions. Climate change effects such as intensified weather events have the potential to affect the development of the site. Such effects may result in damage to facilities or disruption of construction activity. The	

Stage I: Designing & Develop Initial Submarine Dismantling Facilities **Climate Change and Energy Use**	
construction of the facilities may also affect neighbouring coastal areas due to changes in coastal resilience. The emission of CO2 (due to the direct or indirect combustion of fossil fuel) from construction traffic and plant, any use of diesel generators, and the embodied energy within construction materials used would contribute to climate change although this is expected to be less than identified within Options 1 and 2 due to reductions in scale of anticipated construction and redevelopment due to the existing activities anticipated to be already taking place within the wider site. When considering the source of the construction material used, the distance and method of transportation would have a direct effect on overall carbon emissions (for example the different emissions associated with transport by road, rail or ship). The magnitude of effects will depend on the size of the development, the type of materials used, the transport mode and the distance travelled. In this case, the construction of the facilities e is assumed to use material with high embodied carbon values, such as concrete and steel with the potential for the movement of the majority of the materials to be by sea. Opportunities through facility design, construction and subsequent operation should be taken to ensure that energy efficiency is optimised and low carbon energy sources used preferentially throughout the project lifecycle. Although there is anticipated to be reduced emissions of greenhouse gases within Option 3 than in Option 1 and 2, there are still likely to be opportunities to promote the use of energy efficiency measures and low carbon and/or energy sources within the construction and development of the site. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on a broenfield site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities (e.g. security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage. As the scale of construction would be reduced under RC/RPV storage options in the short term, it can be assumed that CO2 emissions would also be less (due to a requirement for fewer materials and a reduction in construction traffic and the use of plant equipment) relative to PW storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further effects would be felt in the longer term during construction of the size reduction facility and associated infrastructure/ancillary facilities and a delay in construction (by approximately 25 years) may mean that the potential effects of climate change (coastal inundation and the increased frequency of more intensive weather events) are more likely to affect activities. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective. This is primarily due to the fact that whilst the majority of ancillary infrastructure will be in place, the dismantling/size reduction facilities and some ancillary facilities will still need to be constructed. The emission of CO2 (due to the direct or indirect combustion of fossil fuel) from staff traffic, construction plant, transport emissions associated with moving construction materials will contribute negatively to this objective. In addition, the embodied energy associated with the construction materials used would also have an indirect negative effect on the objective. Due to the need for the site to be in a coastal location there is a risk that the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. For RC and RPV storage options construction of the size reduction facility would be delayed. This may reduce CO2 emissions associated with construction activities and HGV movements in the short term relative to the PW storage option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further effects would be felt in the longer term during construction of site elements required to support RC/RPV dismantling and a delay in construction (by approximately 25 years) may mean that the potential effects of climate change (coastal inundation and the increased frequency of more	**-**

Stage I: Designing & Develop Initial Submarine Dismantling Facilities Climate Change and Energy Use	
intensive weather events) are more likely to affect activities.	

Stage II: Designing and Developing the Interim ILW Storage Facilities

Climate Change and Energy Use

Option 1: Develop Greenfield Site for ILW Storage

Assessment of Effects:

Given the generic nature of the construction proposals for the interim storage facility, it is assumed that the potential effects associated with this objective will be largely similar as for Stage 1 (construction of dismantling and size reduction facilities).

The construction of the SDP storage facilities and ancillary infrastructure on a greenfield site could result in significant effects on the climate change and energy use objective.

As there is potential for the site to be in a coastal location, it will be important to determine whether the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Any choice of coastal location for the SDP storage facilities must therefore consider the identified sea level changes and the increased frequency of extreme weather conditions. Such effects may result in damage to facilities or disruption of construction activity.

The emission of CO2 (due to the direct or indirect combustion of fossil fuel) from construction traffic and plant, any use of diesel generators, and the embodied energy within construction materials used would contribute to climate change.

When considering the source of the construction material used, the distance and method of transportation would have a direct effect on overall carbon emissions (for example the different emissions associated with transport by road, rail or ship if at a coastal location). The magnitude of effects will depend on the size of the development, the type of materials used, the transport mode and the distance travelled. In this case, the construction of the storage facility and ancillary infrastructure is assumed to use material with high embodied carbon values, such as concrete and steel with the potential for the movement of the majority of the materials to be by sea.

Opportunities through facility design, construction and subsequent operation should be taken to ensure that energy efficiency is optimised and low carbon energy sources used preferentially throughout the project lifecycle.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area, as well reception, admin, dispatching, inspection and maintenance areas. Additional infrastructure will also be required under this land use option such as docking facilities, security (standoff and centre), car parking, roads and internal rail line although the total area required for these additional features is unknown.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities, car parking and roads will also be required under this land use option. Should RPVs be transported by sea (which is the most likely option) then docking facilities would also be required.
- PW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Additional infrastructure including security (standoff and centre), car parking, roads and an external rail line (if required), may also be required under this land use option. As PW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.

The scale and potential significance of effects associated with construction is most likely to be greatest for the development a RC storage facility given the increased footprint and land-take of greenfield land relative to RPV and PW storage options thus creating increased requirements for energy use, CO2 emissions and potential for coastal inundation and further effects on climate change.

Furthermore, due to the need to transport RCs by sea, RC storage facilities would require the construction of a dock and dredging activities, increasing CO2 emissions and the potential for SDP sites to be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised).

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities on a greenfield site).

Stage II: Designing and Developing the Interim ILW Storage Facilities Climate Change and Energy Use	
Summary: Option 1 has been assessed as having a potentially significant negative effect in relation to this objective, due to the significant direct and indirect emissions of CO2 associated with construction activities, transportation and the embodied carbon within the proposed construction materials. The magnitude of the emissions reflect the scale of construction activities anticipated for development of an interim storage facility on a greenfield site. The scale and potential significance of effects associated with construction is most likely to be greatest for the development a RC storage facility given the increased scale of construction relative to RPV and PW storage options. Due to the need to transport RCs by sea, RC storage facilities would also require the construction of a dock and dredging activities, increasing CO2 emissions and the potential for SDP sites to be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised).	--

Option 2: Develop a Brownfield Site for ILW Storage

Assessment of Effects:

The construction of the SDP storage facilities and ancillary infrastructure on a brownfield site would result in a range of emissions similar to those described under Option 1, namely the direct and indirect emissions of CO2 associated with construction activities, transportation and the embodied carbon within the proposed construction materials. Under Option 2, previously developed land would be utilised and it is assumed that there would be a majority of required ancillary infrastructure in place (such as docks, railheads or roads to accommodate the delivery of wastes from a dismantling facility) for required storage which would mean that the scale of required construction would be less.

As there is potential for the site to be in a coastal location, it will be important to determine whether the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Such effects may result in damage to facilities or disruption of construction activity.

When considering the source of the construction material used, the distance and method of transportation would have a direct effect on overall carbon emissions (for example the different emissions associated with transport by road, rail or ship if at a coastal location). The magnitude of effects will depend on the size of the development, the type of materials used, the transport mode and the distance travelled.

Although it is anticipated that there will be reduced emissions of greenhouse gases under Option 2 than, it is assumed that there will still be opportunities to promote the use of energy efficiency measures and low carbon energy sources within the construction and development of the site.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area, as well as reception, admin, dispatching, inspection and maintenance areas. Security facilities including a security centre and standoff area will also be required, as well as an internal rail line. However, it is assumed that docking facilities, car parking and roads will already be present.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and docking facilities (should RPV's be transported by sea) will already be present.
- PW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and external rail line (if required) will already be present. As PW is likely to be transported by either road or rail, it is assumed that there will be no need for a docking facility.

The scale and potential significance of effects associated with construction is most likely to be greatest for the development a RC storage facility given the increased footprint and land-take of greenfield land relative to RPV and PW storage options thus creating increased requirements for energy use, CO2 emissions and potential for coastal inundation and further effects on climate change.

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be

Stage II: Designing and Developing the Interim ILW Storage Facilities

Climate Change and Energy Use

the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).

Summary: Option 2 has been assessed as having a negative effect in relation to this objective due to the direct and indirect emissions of CO2 associated with construction activities, transportation and the embodied carbon within the proposed construction materials. The magnitude of these emissions will be less than those associated with Option 1. This is primarily due to the fact that the majority of ancillary infrastructure will be in place, although some remaining infrastructure and the storage facility itself will still need to be constructed. The scale and potential significance of effects associated with construction is most likely to be greatest for the development a RC storage facility given the increased scale of construction relative to RPV and PW storage options. Due to the potential need for the site to be in a coastal location (for RC and RPV storage options) there is a risk that the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions.	**-**

Option 3: Develop a Licensed/Authorised Site for ILW Storage

Assessment of Effects:

The construction of the SDP storage facilities and ancillary infrastructure on an existing Licensed/Authorised site would result in a range of emissions similar to those described in Option 2, namely the direct and indirect emissions of CO2 associated with construction activities, transportation and the embodied carbon within the proposed construction materials. Under Option 3, an existing Licensed/Authorised site would be utilised and it is anticipated that there would be sufficient existing infrastructure in place thus reducing the amount of CO2 and other greenhouse gases emitted during construction activities further than that identified within Option 1 (and potentially within option 2).

The potential coastal location of the site (essential to receive the transported RCs and, potentially, RPVs) could be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Such effects may result in damage to facilities or disruption of construction activity.

The distance, transportation method and manufacturing processes of selected construction materials will have a direct effect on overall carbon emissions (for example the different emissions associated with transport by road, rail or ship). The magnitude of effects will also depend on the quantities used which will reflect the size of the development.

It is assumed that there would still be opportunities to promote the use of energy efficiency measures and low carbon energy sources within the construction and development of the site.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well reception, admin, dispatching, inspection and maintenance areas. It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present.
- RPV storage will require a facility with an area in the region of 801m^2 (including total vault area and reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present.
- PW storage will require a facility with an area in the region of 1,004.6m^2 (including total vault area as well as reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as security (standoff and centre), car parking, roads and external rail line (if required) are assumed to be already present.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar.

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).

Stage II: Designing and Developing the Interim ILW Storage Facilities Climate Change and Energy Use	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective due to the direct and indirect emissions of CO2 associated with construction activities, transportation and the embodied carbon within the proposed construction materials. The magnitude of these emissions will be less than those associated with Options 1 and 2 as the majority of ancillary infrastructure will be in place. The scale and potential significance of effects associated with construction is most likely to be greatest for the development a RC storage facility given the increased scale of construction relative to RPV and PW storage options. Due to the potential need for the site to be in a coastal location (for RC and RPV storage options) there is a risk that the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions.	-

Stage III: Docking the Submarines and Processing the Reactor Compartments

Climate Change and Energy Use

Option 1: Dock Submarine & Cut-Out Reactor Compartment

Assessment of Effects:

Through the anticipated transportation of the submarine by sea to the dismantling facility it is assumed that regardless of the mode of transport used (wet tow, dry tow or Heavy Lift Vessel) there will be greenhouse gas emissions. However, the total greenhouse gas/carbon footprint of this activity is uncertain due to the uncertainly of the distance to be travelled between location of laid up submarine to the dismantling facility. In order to determine any scale difference in potential greenhouse gas from transport methods it will be important to further understand distance travelled and emission data for each of the transportation options. Additional energy could be required for the retrieval of the intact/partial submarine following a collision event[1]; however, the likelihood of such an event is very small.

All three options involve common life cycle activities many of which consume considerable energy such as dewatering the dock, cutting techniques and movement of the RC. Furthermore, the use of industrial process gases, such as oxyacetylene, in shot blasting and hot cutting will release carbon dioxide emissions. The total energy required and carbon/greenhouse gas footprint of these activities (due to the direct or indirect combustion of fossil fuel) is uncertain but would contribute to climate change although this is expected to be a minor contribution.

Vehicle movements associated with staff, operational material and equipment are expected to increase emissions of greenhouse gases, contributing to climate change although this is expected to be a minor contribution. The total movement of vehicles associated to this stage of dismantling operations will be least for Option 1 (as dismantling has been limited and only very small amounts of LLW (if at all) will have been generated).

Due to the need for the site to be in a coastal location, the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Climate change effects such as intensified weather events have the potential to affect the operation of the dismantling site, possibly through damage to the facility or through disrupting or delaying activities. Although it is considered that the location of the dismantling site will have been chosen to avoid these predicted effects and the appropriate flood defence or resilience measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact.

For each of the technical options, there is potential across the dismantling process for a the reuse/recycling of reclaimed material, such as slag, metals, pipework, and the steel shot used in the process of shot blasting the hull. This would present an opportunity to save considerable energy.

Proposed Mitigation / Enhancements Measures:

- Seek to minimise the distance travelled by submarines between lay up and dismantling sites.
- Conduct an environmental assessment, including emission rates, of different transport of submarine options.
- Measures to reduce private vehicle use for travel to/from work and transport distances for plant workers should be implemented.
- Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators. The potential for renewable energy generation (e.g. solar panels, dedicated wind turbines, ground source heat pumps or biomass boilers) to meet energy needs on site should be considered.
- Where viable alternatives exist, seek to choose techniques will lower energy intensities.
- Measures to reduce the effects of increases in vehicular greenhouse gas emissions should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; and maximising energy efficiency.
- Where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.

Summary:	
Option 1 has been assessed as having a negative effect in relation to this objective, due to the emissions of greenhouse gases associated with operational activities and transport of submarine to the dismantling site and associated transport of workers and materials/equipment.	**-**

Stage III: Docking the Submarines and Processing the Reactor Compartments Climate Change and Energy Use	
Postponing the size reduction of RC and processing towards PW until after interim storage has the potential to decrease the overall energy used due to the potential for developments in less energy intensive dismantling techniques. Delay will also have the benefit of using energy with lower carbon emissions, as at the period in which the dismantling will take place (post 2030), the UK electricity network will have substantial reduced its carbon emissions in line with the Climate Change Act targets. However, such benefits will be recognised in the assessment of stage 6 and are only noted here. Due to the need for the site to be in a coastal location, the operational dismantling activities or the facility itself may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. This risk is the same across each of the technical options. Although there is the potential to save considerable energy through the reuse/recycling of reclaimed materials, this is considered to be small compared to the total energy expended during operations and movement of submarines.	
Option 2: Dock Submarine & Cut-Out Reactor Pressure Vessel	
Assessment of Effects: All of the technical options will require the transportation of the submarine by sea and have the same uncertainties regarding distance travelled and mode of ocean going transport (either, wet tow, dry tow or standard cargo vessel). As a result, the associated emissions from this activity and risks of collision will be the same across each of the technical options (see option 1). Under this option, the RPV will be removed from the submarine hull for storage with some LLW arising in the RPV removal and storage process. Whilst the intrusive activities are greater than Option 1, the scale will be less and it is considered likely (but uncertain) that overall they will be less than Option 1. It should also be noted that Option 2 (like Option 1) will delay the activities associated with RPV size reduction and packaged waste processing until after the period of interim storage. In this intervening period, there is potential for development of alternative less energy intense techniques for RPV removal and storage and for the decarbonisation of electricity generation. There will be increase in vehicle movements when compared to Option 1 as a result of the additional movements of LLW generated, packaged and transported to the National LLW Repository in Cumbria. However, total movements at this stage are expected to be small and not significant. The risk of operations being negatively affected due to climate change effects, such as sea level rise or extreme weather events is the same across each of the technical options (see option 1). For each of the technical options, there is potential across the dismantling process for a the reuse/recycling of reclaimed material, such as slag, metals, pipework, and the steel shot used in the process of shot blasting the hull. This would present an opportunity to save energy. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a negative effect in relation to this objective, due to the emissions of greenhouse gases associated with operational activities and transport of submarine to the dismantling site and associated transport of workers and materials/equipment. Postponing the dismantling of RPV and processing packaged waste until after interim storage has the potential to decrease the overall energy used due to the potential for developments in less energy intensive dismantling techniques. Delay will also have the benefit of using energy with lower carbon emissions, as at the period in which the dismantling will take place (post 2030), the UK electricity network will have substantial reduced its carbon emissions in line with the Climate Change Act targets. However, such benefits will be recognised in the assessment of stage 6 and are only noted here. Due to the need for the site to be in a coastal location, the operational dismantling activities or the facility itself may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions, and this risk is the same across each of the technical options. Although there is the potential to save considerable energy through the reuse/recycling of reclaimed materials, this is considered	-

Stage III: Docking the Submarines and Processing the Reactor Compartments Climate Change and Energy Use	
to be small compared to the total energy expended during operations and the movement of submarines.	
Option 3: Dock Submarine & Cut-up Packaged Waste	

Assessment of Effects:

All of the technical options will require the transportation of the submarine by sea and have the same uncertainties regarding distance travelled and mode of transport (either wet tow, dry tow or standard cargo vessel). As a result, the associated emissions from this activity and risks of collision will be the same across each of the technical options (see Option 1).

Option 3 requires the removal of RPV from the RC, and its subsequent size reduction and segregation into LLW and ILW packaged waste. The removal of the RPV, reassembly of the submarine for transportation to the commercial ship recycling facility, and the size reduction of the RPV and the packaging of wastes have the potential to be energy intensive and result in direct and indirect greenhouse gas emissions. The use of industrial process gases, such as oxyacetylene, in shot blasting and hot cutting will release carbon dioxide emissions may also contribute to greenhouse gas emissions. The total energy required and carbon/greenhouse gas footprint of these activities (due to the direct or indirect combustion of fossil fuel) is uncertain but would make a contribution to climate change. As all dismantling and processing activities will occur prior to interim storage, Option 3 will require more energy than Option 1 and 2 for this stage. Undertaking all activities within the same timescale also means that the opportunity to benefit from future less energy intensive dismantling techniques as well as the future decarbonisation of electricity generation is lost.

There will be increased vehicle movements when compared to either Options 1 or 2 as a result of additional processing activities associated with RPV and the movement of the LLW arising to the National LLW Repository in Cumbria.

The risk of operations being negatively affected due to climate change effects, such as sea level rise or extreme weather events is the same across each of the technical options (see Option 1).

For each of the technical options, there is potential across the dismantling process for a the reuse/recycling of reclaimed material, such as slag, metals, pipework, and the steel shot used in the process of shot blasting the hull. This would present an opportunity to save considerable energy.

Proposed Mitigation / Enhancements Measures

- No additional mitigation measures proposed above those set out for Option 1.

Summary:	
Option 3 has been assessed as having a negative effect in relation to this objective, due to the emissions of greenhouse gases associated with operational activities and transport of submarine to the dismantling site and associated transport of workers and materials/equipment. Due to the need for the site to be in a coastal location, the operational dismantling activities or the facility itself may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions, and this risk is the same across each of the technical options. Although there is the potential to save considerable energy through the reuse/recycling of reclaimed materials, this is considered to be small compared to the total energy expended during operations and the movement of submarines.	-

Stage IV: Dismantling and Recycling the Residual Submarine Hulls and Processing Wastes

Climate Change and Energy Use

All Options

Assessment of Effects:

Operational activities will include the use of energy intensive techniques, such as hot cutting and shot blasting. Furthermore, the use of industrial process gases, such as oxyacetylene, in shot blasting and hot cutting will release carbon dioxide emissions. However, the total energy required and carbon/greenhouse gas footprint of these activities (due to the direct or indirect combustion of fossil fuel) is uncertain. It is considered as the activities conducted presently at the ship recycling facility will be of a similar nature to those required for the dismantling of the submarine sections and therefore energy expenditure and greenhouse gas emissions will be similar to those from current activities.

Through the transportation of the processed submarines by sea from the dismantling facility to the ship-recycling facility it is assumed that regardless of the mode of transport used (barge/semi submersible ship, towing) there will be associated greenhouse gas emissions. However, the quantification of any such emissions is unknown due to the uncertainty regarding the distance travelled between dismantling facility and ship-recycling facility and the mode of transport used although in comparison to the scale of existing shipping movements, the quantities are likely to be trivial.

Vehicle movements to and from the dismantling site and the ship-recycling site (including movement of staff, plant equipment, waste and recycled materials) are expected to increase emissions of greenhouse gases. The total emissions from these movements will depend on the total distance travelled, the volumes of waste and recycled material generated and the type of vehicles used and their emission rates; however, emissions are expected to be small given that the scale of HGV movements of recyclate is estimated to be in the order 200 – 300 per annum.

Due to the need for both the dismantling and ship recycling facilities to be in coastal locations, the facilities may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Climate change effects such as intensified weather events have the potential to affect the operation of the dismantling site, through damage to the facility, causing disruption/delays to activities or potential mobilisation of hazardous substances (however as part of environmental permitting requirements it is assumed that hazardous substances will be contained in watertight containers). Although, it is considered that the location of the sites will have been chosen to avoid these predicted effects and the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact.

There is potential across the recycling process for the reuse/recycling of reclaimed material, such as slag, metals, pipework, and the steel shot used in the process of shot blasting the hull. The volumes of material recycled should be substantial (estimated to be > 2500 tonnes per submarine, and including steel, aluminium, copper, lead and brass) and would present an opportunity to save considerable energy.

Proposed Mitigation / Enhancements Measures:

- Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators. The potential for renewable energy generation (e.g. solar panels, dedicated wind turbines, ground source heat pumps or biomass boilers) to meet energy needs on site should be considered.
- Where viable alternatives exist, seek to choose techniques will lower energy intensities.
- Seek to minimise the distance travelled by submarines between dismantling site and ship-recycling site
- Conduct an environmental assessment, including emission rates, of different transport of submarine options.
- Where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.

Summary: This stage has been assessed as having a negative effect in relation to this objective, due to the emissions of greenhouse gases associated with operational activities and transport of submarines to the ship-recycling site and associated transport of workers and materials/equipment. Due to the need for both the dismantling site and the ship-recycling site to be in a coastal location, the facilities may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions, through damage to the facility, disruptions/delays to activities or potential mobilisation of hazardous materials, however, this is not considered to be significant.	**-**

Stage IV: Dismantling and Recycling the Residual Submarine Hulls and Processing Wastes Climate Change and Energy Use	
Although there is the potential to save considerable energy through the reuse/recycling of reclaimed materials, this is considered to be small compared to the total energy expended during operations and movement of submarines.	

Stage V: Transport RC/RPV/ILW to Interim Storage Climate Change and Energy Use	
Option 1: Reactor Compartment Transport and Storage	
Assessment of Effects: The movement of RC from the dismantling facility to the interim storage facility is expected to occur by sea via barge which will result in greenhouse gas emissions, including carbon dioxide from the marine diesel engines. However, the total carbon footprint/greenhouse gas emissions will depend upon the total distance travelled between the dismantling site and storage site, which as the locations are not known is uncertain. The age and fuel efficiency/emissions rates of the barge used to transport the RC may also influence total emissions However, as it is expected that only one submarine will be processed per annum it is assumed that the emissions from this transport will be relatively low. Additional energy could be required for the retrieval of the RC following a collision event; however, the likelihood of such an event is very small. It is expected that during interim storage there will be minimal maintenance or energy expenditure required. However, natural aging of RCs whilst in storage may result in the need for additional maintenance against issues such as corrosion in order to monitor and maintain the structural integrity. Due to the need for the dismantling and storage sites to be in a coastal location, both sites may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Climate change effects such as intensified weather events have the potential to affect the operation of the dismantling and/or storage, possibly through damage to the facility or through disrupting or delaying activities. Although it is considered that the location of the dismantling site will have been chosen to avoid these predicted effects and the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact. **Proposed Mitigation / Enhancements Measures:** • Seek to minimise the distance travelled between dismantling and storage site. • Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators. The potential for renewable energy generation (e.g. solar panels, dedicated wind turbines, ground source heat pumps or biomass boilers) to meet energy needs on site should be considered. • Measures to reduce the effects of increases in vehicular greenhouse gas emissions should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; and maximising energy efficiency. • Where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.	
Summary: Option 1 has been assessed as having a neutral effect in relation to this objective. Any emissions of greenhouse gases associated with the transport of RC to the storage site and associated transport of workers and materials/equipment are considered too small to be significant. Due to the need for the site to be in a coastal location, the operational dismantling activities or the facility itself may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. This risk is the same across each of the technical options.	**0**
Option 2: Reactor Pressure Vessel Transport and Storage	
Assessment of Effects: The movement of RPV from the dismantling facility to the storage facility is potentially possible by sea, rail or road. However it is considered that there will be no greenhouse gas emissions during the preparation of RPV for transportation to the interim storage facility. The choice of transport method for RPV from the dismantling facility to the storage facility is currently uncertain. The total carbon footprint/greenhouse gas emissions from transportation will depend upon the total distance travelled between the sites, which as the locations are not known is uncertain, the mode of transport chosen, the fuel used and the energy efficiency of the transport vehicle. However, it is	

Stage V: Transport RC/RPV/ILW to Interim Storage Climate Change and Energy Use	
expected that there will be fewer emissions from transport by sea than by road, depending on the routes taken. As it is expected that only one submarine will be processed per annum and the RPV will fit on one barge or HGV it is assumed that the emissions from this transport will be low. Additional energy could be required for the retrieval of the RC following a collision event by sea or road; however, the likelihood of such an event is very small. It is expected that during interim storage there will be minimal maintenance and associated vehicle movements required (linked to staff movements and waste). Therefore, the energy expended during these processes is considered to be minimal and unlikely to be significant. The risk of operations being negatively affected due to climate change effects, such as sea level rise or extreme weather events is the same across each of the technical options (see Option 1). **Proposed Mitigation / Enhancements Measures:** • Seek to minimise the distance travelled between dismantling and storage site. • Conduct an environmental assessment, including emission rates, of different transport options. • Measures to reduce private vehicle use for travel to/from work and transport distances for plant workers should be implemented. • Measures to reduce the effects of increases in vehicular greenhouse gas emissions should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; and maximising energy efficiency. • Where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.	
Summary: Option 2 has been assessed as having a neutral effect in relation to this objective, due to the small scale emissions of greenhouse gases associated with operational activities and transport of submarine to the dismantling site and associated transport of workers and materials/equipment. Due to the need for the site to be in a coastal location, the operational dismantling activities or the facility itself may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions, and this risk is the same across each of the technical options.	**0**
Option 3: Packaged Waste Transport and Storage	
Assessment of Effects: Packaged waste could be transported from the dismantling facility to the interim storage facility by either rail or road. It is considered that there will be no greenhouse gas emissions during the preparation of packaged waste for transportation to the interim storage facility. It is assumed that if transportation by road is chosen that the boxes will fit on a standard articulated HGV. As it is envisaged that only one submarine will be processed a year and 8 boxes of packaged waste will be produced per submarine it is expected that transportation to interim storage will require 1 movement every 1.5 months. This is considered to be of a scale unlikely to significantly increase greenhouse gas emissions. Packaged waste may also be transported by rail, which if used, could further decrease the overall greenhouse gas emissions during transportation. The risk of operations being negatively affected due to climate change effects, such as sea level rise or extreme weather events is the same across each of the technical options (see Option 1). It is expected that during interim storage there will be minimal maintenance and associated vehicle movements (linked to staff movements and waste) required. Therefore, the energy expended during these processes is considered to be minimal and unlikely to be significant. **Proposed Mitigation / Enhancements Measures** • Seek to minimise the distance travelled by submarines between lay up and dismantling sites.	

Stage V: Transport RC/RPV/ILW to Interim Storage Climate Change and Energy Use	
• Measures to reduce private vehicle use for travel to/from work and transport distances for plant workers should be implemented. • Measures to reduce the effects of increases in vehicular greenhouse gas emissions should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; and maximising energy efficiency. • Where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective, due to the emissions of greenhouse gases associated with operational activities and transport of submarine to the dismantling site and associated transport of workers and materials/equipment. Due to the need for the site to be in a coastal location, the operational dismantling activities or the facility itself may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions, and this risk is the same across each of the technical options.	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the proposed GDF

Climate Change and Energy Use

Option 1: Reactor Compartment Segregation and Size Reduction, PW Transfer to Proposed GDF

Assessment of Effects:

Depending on the location of the dismantling facility for removal of the RPV from the RC, and the size reduction facility for the packaging of ILW vis-à-vis the interim storage facility, there may be a requirement to transport RCs prior to processing, it is expected due to the size and weight of RC that this will only occur by sea and by barge. However, the total carbon footprint/greenhouse gas emissions will depend upon the total distance travelled between the dismantling site and storage site, which as the locations are not known is uncertain. The age and fuel efficiency/emissions rates of the barge used to transport the RC may also influence total emissions However, as it is expected that only one submarine will be processed per annum it is assumed that the emissions from this transport will be relatively low. Additional energy could be required for the retrieval of the RC following a collision event; however, the likelihood of such an event is very small.

Whilst all three options involve common life cycle activities, for this stage, Option 1 requires more of these activities during this phase of dismantling and is therefore likely to be the most energy intensive of the three options. Energy will be used in the cutting techniques and movement of the RC as well as in shot blasting and hot cutting. The total energy required and carbon/greenhouse gas footprint of these activities (due to the direct or indirect combustion of fossil fuel) is uncertain but would contribute to climate change although this is expected to be a minor contribution.

However, postponing the dismantling of RC and processing PW until after interim storage has the potential to decrease the overall energy used due to the potential for developments in less energy intensive dismantling techniques. Delay will also have the benefit of using energy with lower carbon emissions, as at the period in which the dismantling will take place (post 2030), the UK electricity network will have substantial reduced its carbon emissions in line with the Climate Change Act targets.

Vehicle movements associated with staff, operational material and equipment are expected to increase emissions of greenhouse gases, contributing to climate change although this is expected to be a minor contribution. There will be increased vehicle movements when compared to either Options 2 or 3 as a result of additional processing activities associated with RPV and the movement of the LLW arising to the National LLW Repository in Cumbria.

Due to the need for the site to be in a coastal location, the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Climate change effects such as intensified weather events have the potential to affect the operation of the dismantling site, possibly through damage to the facility or through disrupting or delaying activities. Although it is considered that the location of the dismantling site will have been chosen to avoid these predicted effects and the appropriate flood defence or resilience measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact.

For each of the technical options, there is potential across the dismantling process for the reuse/recycling of reclaimed material, such as slag, metals and pipework. This would present an opportunity to save considerable energy.

As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated risks on adjacent sensitive receptors, the route of the transport is not known however exhaust emissions from transport movements may also contribute increases in particulate matter and gaseous pollutants (particularly NOx and carbon dioxide (CO2) although again these are expected to be minimal. Therefore it is determined that transportation of packaged waste is not expected to pose any effect to climate change, under normal operating circumstances.

Proposed Mitigation / Enhancements Measures:

- Where viable alternatives exist, seek to choose techniques will lower energy intensities.
- Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators. The potential for renewable energy generation (e.g. solar panels, dedicated wind turbines, ground source heat pumps or biomass boilers) to meet energy needs on site should be considered.

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the proposed GDF

Climate Change and Energy Use

- Measures to reduce private vehicle use for travel to/from work and transport distances for plant workers should be implemented.
- Measures to reduce the effects of increases in vehicular greenhouse gas emissions should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; and maximising energy efficiency.
- Where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.

Summary:	
Option 1 has been assessed as having a negative effect in relation to this objective, due to the emissions of greenhouse gases associated with operational activities during segregation and size reduction of the reactor compartment and transport of the associated packaged waste. Postponing the dismantling of RC and processing packaged waste until after interim storage has the potential to decrease the overall energy used due to the potential for developments in less energy intensive dismantling techniques. Delay will also have the benefit of using energy with lower carbon emissions, as at the period in which the dismantling will take place (post 2030), the UK electricity network will have substantial reduced its carbon emissions in line with the Climate Change Act targets. Due to the need for the site to be in a coastal location, the operational dismantling activities or the facility itself may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. This risk is the same across each of the technical options. Although there is the potential to save considerable energy through the reuse/recycling of reclaimed materials, this is considered to be small compared to the total energy expended during operations and movement of submarines.	-

Option 2: Reactor Pressure Vessel Segregation and Size Reduction, PW Transfer to Proposed GDF

Assessment of Effects:

Under this option, the RPV will be removed from interim storage and will undergo segregation and size reduction until reduced in to the packaged waste state. Through the anticipated transportation of the RPV to the segregation and size reduction facility from the interim storage facility it is assumed that there will be greenhouse gas emissions. However, the total greenhouse gas/carbon footprint of this activity is uncertain due to the uncertainly of the distance to be travelled. In order to determine any scale difference in potential greenhouse gas it will be important to further understand distance travelled and emission data for each of the available option.

Option 2 will involve fewer activities than Option 1, although these will still include cutting, hot cutting and shot blasting. In consequence, whilst the total energy required and carbon/greenhouse gas footprint of these activities (due to the direct or indirect combustion of fossil fuel) is uncertain it is anticipated to be less than for Option 1.

It should also be noted that Option 2 (like Option 1) will have delayed the activities associated with RPV segregation, size reduction and packaged waste processing until this stage. In this intervening period, there is potential for development of alternative less energy intense techniques for RPV segregation and size reduction and for the decarbonisation of electricity generation.

The risk of operations being negatively affected due to climate change effects, such as sea level rise or extreme weather events is only considered to be the same if a site is identified for RPV as being located in a coastal location. (see Option 1).

Vehicle movements associated with staff, operational material and equipment are expected to increase emissions of greenhouse gases, contributing to climate change although this is expected to be a minor contribution.

For each of the technical options, there is potential across the dismantling process for the reuse/recycling of reclaimed material, such as slag, metals and pipework. This would present an opportunity to save energy.

The transportation of packaged waste is not expected to pose any effect to climate change, under normal operating circumstances.

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the proposed GDF **Climate Change and Energy Use**	
Proposed Mitigation / Enhancements Measures: • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a negative effect in relation to this objective, due to the emissions of greenhouse gases associated with operational activities during segregation and size reduction of the RPV and transport of the associated packaged waste. Postponing the segregation, size reduction and processing to PW until after interim storage has the potential to decrease the overall energy used due to the potential for developments in less energy intensive dismantling techniques. Delay will also have the benefit of using energy with lower carbon emissions, as at the period in which the segregation and size reduction will take place (post 2030), the UK electricity network will have substantial reduced its carbon emissions in line with the Climate Change Act targets. Due to the need for the site to be in a coastal location, the operational segregation and size reduction activities or the facility itself may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions, and this risk is the same across each of the technical options. Although there is the potential to save considerable energy through the reuse/recycling of reclaimed materials, this is considered to be small compared to the total energy expended during operations and the movement of submarines.	**-**
Option 3: Transport Packaged Waste to Proposed GDF	
Assessment of Effects: Option 3 will have seen the cut out of RPV from the RC, and its subsequent size reduction and segregation into LLW and ILW PW during stage 3 and therefore does not require further assessment. Undertaking all activities at an earlier stage also means that the opportunity to benefit from future less energy intensive dismantling techniques is lost as well as the future decarbonisation of electricity generation. The risk of operations being negatively affected due to climate change effects, such as sea level rise or extreme weather events is the same across each of the technical options (see Option 1). The transportation of packaged waste is not expected to pose any effect to climate change, under normal operating circumstances. **Proposed Mitigation / Enhancements Measures** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a neutral effect in relation to this objective, due to a range of factors. The emissions of greenhouse gases associated with operational activities and transport of packaged waste to the proposed GDF and associated transport of workers and materials/equipment although these are significantly reduced under this option. The risk of the storage facility being affected by climate events such as sea level rise will only have an effect if the site is positioned in a coastal location which for this option is not a requirement. Undertaking all segregation and size reduction activities at an earlier stage also means that the opportunity to benefit from future less energy intensive dismantling techniques is lost as well as the future decarbonisation of electricity generation.	**0**

Stage VII: Decommissioning the SDP Facilities

Climate Change and Energy Use

Option 1: Decommission Greenfield Sites

Assessment of Effects:

The decommissioning and demolition of the SDP facilities and ancillary infrastructure on a greenfield site could result in a range of effects on the climate change and energy use objective. It is assumed that all/most of the infrastructure and ancillary facilities as well as the dismantling, size reduction and interim storage facilities will be required to be demolished, including but not restricted to; docks, rail head, roads, cranes and admin offices. Furthermore in order to restore the land to its original greenfield state all hardstanding will need to be removed increasing the levels of land excavation required relative to Options 2 and 3.

SDP sites in coastal locations may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing a sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Climate change effects such as intensified weather events have the potential to affect SDP sites. The previous development of the facilities may have also affected neighbouring coastal areas due to changes in coastal resilience and will need to be considered in their demolition as part of the decommissioning of the site and a return to a greenfield land classification. This potentially could require retaining any additional coastal defences built as part of the site reconfiguration developed for the operational stage of the programme.

The emission of CO2 (due to the direct or indirect combustion of fossil fuel) from demolition machinery and plant, as well as traffic would contribute to climate change.

When considering the waste streams that will be created through the demolition of the site infrastructure , the distance and method of transportation would have a direct effect on overall carbon emissions (for example the different emissions associated with transport by road, rail or ship). The magnitude of effects will depend on the size of the development, the type of materials used during the construction phase and thus the waste streams to be created, the transport mode and the distance travelled.

Following completion of decommissioning activities, there would be no further emissions or energy use associated with SDP activities, which will reduce effects on climate change in the long term.

Technical Options

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and PW storage options and, on a greenfield site, removal of docking facilities alongside other infrastructure would also be required. Therefore, it is expected that energy use and CO2 emissions related to the use of plant equipment and demolition traffic will be greater than for the other technical options.

Furthermore, due to the need to transport RCs by sea, a RC storage facility would be coastally located and activities may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions and retention of coastal defences may be required. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised).

Proposed Mitigation / Enhancements Measures:

- Ensure that FRA informs site suitability prior to development and that this is confirmed with the plans and programmes for decommissioning.
- Where practicable, provision should be made for the transport of waste materials via rail or sea.
- Measures to reduce private vehicle use for travel to/from work and transport distances should also be implemented.
- Demolition waste generation on site should be minimised (where transport off-site would be required) in order to limit carbon emissions associated with this additional transport requirement.
- Where possible, the use of mains electricity to power equipment and plant would be preferential to diesel or petrol powered generators.

Stage VII: Decommissioning the SDP Facilities Climate Change and Energy Use	
Summary: Option 1 has been assessed as having a long term positive effect in relation to this objective due to the reduction in emissions and energy use following the cessation of SDP activities. However, the impact of extensive demolition and associated activities required to return SDP sites back to a greenfield state is expected to require a high level of energy use and will have a negative effect on this objective in the short to medium term. This is further exacerbated by the greenhouse gas emissions associated with the transport of significant quantities of waste materials from the site (although this can be in part mitigated through the use of sea or rail transport in preference to road). RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and PW storage options and therefore, it is expected that energy use and CO2 emissions related to the use of plant equipment and demolition traffic will be greater. Coastally located SDP sites (including interim storage facilities under RC and, potentially, RPV storage options) may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. The construction of the facilities may also affect neighbouring coastal areas due to changes in erosion and sediment deposition rates, and therefore it may be necessary to retain some of the coastal defences built for the operational stage of the programme.	**-/+**

Option 2: Decommission Brownfield Sites

Assessment of Effects:

The demolition of SDP facilities constructed on brownfield land could result in effects on the climate change and energy use objective similar to those outlined for Option 1. However, due to the assumed reduced levels of demolition required (due to existing infrastructure being left ‘in situ’ where possible), the scale of these potential effects is considered to be less. Specifically, under Option 2, given the reduced demolition and land excavation required it is expected that decommissioning will generate less general waste decreasing the volumes of waste transported off site for disposal.

As for Option 1, following completion of decommissioning activities, there would be no further emissions or energy use associated with SDP activities, which will reduce effects on climate change in the long term.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and PW storage options. Therefore, it is expected that energy use and CO2 emissions related to the use of plant equipment and demolition traffic will be greater than for the other technical options.

Furthermore, due to the need to transport RCs by sea, a RC storage facility would be coastally located and activities may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions and retention of coastal defences may be required. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised).

Proposed Mitigation / Enhancements Measures:

- No additional measures beyond those proposed for Option 1.

Summary: Option 2 has been assessed as having a long term positive effect in relation to this objective due to the reduction in emissions and energy use following the cessation of SDP activities.	

Stage VII: Decommissioning the SDP Facilities Climate Change and Energy Use	
However, in the short to medium term, the demolition activities required for Option 2 will have a negative effect, although this negative effect is expected to be less than that identified under Option 1. This is primarily due to the fact that, whilst the majority of infrastructure will be retained for future uses, some infrastructure and the dismantling, size reduction and interim storage facilities will still need to be demolished. The emission of CO2 (due to the direct or indirect combustion of fossil fuel) from staff traffic, construction/demolition plant and transport emissions associated with moving demolition waste materials will contribute negatively to this objective. RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and PW storage options and therefore, it is expected that energy use and CO2 emissions related to the use of plant equipment and demolition traffic will be greater. Coastally located SDP sites (including interim storage facilities under RC and, potentially, RPV storage options) may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. The construction of the facilities may also affect neighbouring coastal areas due to changes in erosion and sediment deposition rates, and therefore it may be necessary to retain some of the coastal defences built for the operational stage of the programme.	**-/+**
Option 3: Decommission a Licensed/Authorised Site	
Assessment of Effects: The demolition of SDP facilities constructed on existing Licensed/Authorised sites could result in effects on the climate change and energy use objective similar to those outlined for Options 1 and 2. However, due to the assumed reduced levels of demolition required (as some existing infrastructure/ancillary facilities will be left 'in situ' where possible), the scale of these potential effects is considered to be less. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1 are proposed. **Technical Options:** As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence of the technical options on their severity is also expected to be similar. **Assumptions and Uncertainties:** • Assumptions and uncertainties are considered to be the same as for Option 1.	
Summary: Option 3 has been assessed as having a long term positive effect in relation to this objective due to the reduction in emissions and energy use following the cessation of SDP activities. However, the demolition activities required for Option 3 will have a negative effect in relation to this objective in the short to medium term, although this negative effect is expected to be less than that identified under Options 1 and 2. This is primarily due to the fact that, whilst the majority of ancillary infrastructure/facilities will be retained for future uses, some infrastructure and the dismantling, size reduction and interim storage facilities will still need to be demolished. The emission of CO2 (due to the direct or indirect combustion of fossil fuel) from staff traffic, construction/demolition plant and transport emissions associated with moving demolition waste materials will contribute negatively to this objective. RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and PW storage options and therefore, it is expected that energy use and CO2 emissions related to the use of plant equipment and demolition traffic will be greater. Coastally located SDP sites (including interim storage facilities under the RC and, potentially, RPV storage options) may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. The construction of the	**-/+**

Stage VII: Decommissioning the SDP Facilities Climate Change and Energy Use	
facilities may also affect neighbouring coastal areas due to changes in erosion and sediment deposition rates, and therefore it may be necessary to retain some of the coastal defences built for the operational stage of the programme.	

8.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the climate change and energy use objective. **Box 8.2** provides a summary of the options that have been assessed.

Box 8.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 8.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.	-/?	-/?	-/?	**Potential Effects** SDP activities would generate CO_2 and greenhouse gas emissions and increase energy use when compared to the current baseline. The emission of CO_2 due to the direct or indirect combustion of fossil fuel from traffic and plant, any use of diesel generators, and the embodied carbon within construction materials used would contribute to climate change. Furthermore, the use of industrial process gases, such as oxyacetylene in hot cutting will release CO_2 emissions. The removal of the RC, reassembly of the processed submarine for transportation to the commercial ship recycling facility, and the subsequent full dismantling of the RC and RPV following interim storage have the potential to be relatively energy intensive and result in direct and indirect greenhouse gas emissions. Estimated energy use associated with SDP activities are not available at this time; however there is not anticipated to be a substantial increase in energy expenditure and greenhouse gas emissions when compared to current levels at the Devonport and Rosyth dockyards and emissions are not anticipated to exceed permitted levels. Interim storage of the RC is assumed to be a relatively passive activity and is not expected to be energy intensive. However, in comparison to the other technical options, natural aging of RCs whilst in storage may result in the need for additional maintenance against issues such as corrosion in order to monitor and maintain the structural integrity. For example, energy would be required for operation of a water run-off catchment facility to enable monitoring for containment and for additional inspection of the RC hull. At this stage, construction material requirements, quantities and sourcing are unknown. Notwithstanding this, the SDP facilities are assumed to require construction materials with high embodied carbon values such as concrete, and steel. When considering the source of the material used, the distance and method of transportation would have a direct effect on overall carbon emissions (e.g. the different emissions associated with transport by road, rail or ship). Notwithstanding this, taking account of the scale of development and estimated transport movements for submarine transportation and transport of LLW and ILW and the timescales over which transport movements would occur, greenhouse gas emissions associated with transport are not anticipated to be significant when compared to current emissions from either Devonport or Rosyth. At both the Devonport and Rosyth dockyards there is the opportunity to transport materials by rail or sea. There may be some opportunity to implement energy efficiency measures and utilise low carbon sources when modifying existing facilities and constructing new facilities at the Devonport and Rosyth dockyards. There may also be the potential to reuse/recycle construction materials and material from dismantling, segregation and packaging activities. This would present an opportunity to save considerable energy. Given their locations, both the Devonport and Rosyth dockyards are vulnerable to coastal inundation or sea level rise related to climate change and extreme weather conditions, which may result in damage to facilities, disruption of activity and the potential mobilisation of pollutants and hazardous materials (*refer to impacts specific to the Devonport and Rosyth dockyards*). Although flood defence measures would be incorporated into SDP facility design, given the uncertain nature of climate change there is still the potential for an impact. Submarine transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility could also be affected by climate change, in particular extreme weather conditions *(refer to impacts specific to the Devonport and Rosyth dockyards).* Of the technical options, the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2 which due to its scale may require more resources to construct, emissions and energy use during construction could be greater.

Assessment Criteria	Score			Commentary
	1D	1R	1B	
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	In the case of this option, however, ILW would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the RC. Overall, this option could therefore generate fewer emissions associated with transport when compared to those options proposing interim storage at a remote site. Total vehicle movements associated with radioactive waste transportation to the LLWR and proposed GDF (once full dismantling of the RC has been completed) is expected to be the same across the technical options. However, the transport of LLW and ILW off-site would be delayed until after the interim storage period. During this delay there is the potential for more energy efficient vehicles or an increase in renewable fuels/electric vehicles which could decrease emissions, however this is very uncertain. In addition, as full dismantling would be deferred until after the period of interim storage there is the potential for development of alternative less energy intensive techniques for RC size reduction and processing to packaged waste during this delay, which could reduce total greenhouse gas emissions. However, this is very uncertain. **Devonport Dockyard** In 2008, electricity (non-operational) consumption at Devonport dockyard totalled 95GWh, a reduction of 3GWh compared to 2007 (98GWh in 2007). Devonport dockyard has been awarded the Carbon Trust Standard for reducing CO_2 emisisons. The permitted release allocation of CO_2 at Devonport dockyard is 19,225 tonnes of CO_2 for 2008-2012. In 2008, 19,225 tonnes of CO_2 was released at Devonport dockyard, a decrease of 1,914 tonnes of CO_2 compared to 2007 (21,139 tonnes in 2007). CO_2 released in 2008 is nearly 8,000 tonnes less than the maximum permitted by the EA. Potential energy use and emissions from SDP activities at Devonport dockyard are not known at this stage. However, taking into account the scale and nature of the activities proposed, which are similar to current activities being undertaken at Devonport dockyard, the SDP is not expected to result in a significant increase in energy use and emissions above current levels, and emissions are not anticipated to exceed permitted levels. The climate of the Plymouth area is temperate maritime with the prevailing wind direction from the south-west. The proximity of the English Channel mitigates the effect of any prolonged cold spells. Snowfall in the Plymouth area is on average 10 to 15 days per year and is usually not deep enough to be measured except for 2 to 3 days a year. Air temperatures less than 0°C are recorded on around 20 nights between October and May. Thunder occurs around 10 days per year (higher incidence in May and August than the rest of the year), with December and January generally receiving more rainfall than other months. Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Due to its coastal location, Devonport dockyard is vulnerable to a number of extreme weather events, including storm surge, wind induced waves from high winds, hurricanes and tornadoes, and tsunami (caused by seismic events on the sea floor west of Portugal). EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Taking account of current flood risk SDP activities within Devonport dockyard are not anticipated to be at significant risk of flooding. However, there could be the potential for impacts during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes, or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding.
H. Climate Change and Energy Use Reduce energy consumption,	-/?	-/?	-/?	There is the potential for submarine transportation to and from Devonport dockyard to be affected by climate change, in particular severe weather conditions such as a storm surge, wind induced waves, and tsunamis which may result in damage to the towing vessel, submarine or heavy lift vessel, disruption of activity, the potential mobilisation of pollutants and hazardous materials, and in extreme circumstances sinking of the vessel. Heavy lift

Assessment Criteria	Score			Commentary
	1D	1R	1B	
minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*				operations in particular would be more vulnerable to disruption from extreme weather conditions, due to the location of the heavy lift vessel within the estuary channel although based on current known information, it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. **Rosyth Dockyard** Potential energy use and emissions from SDP activities at Rosyth dockyard are not known at this stage. However, taking into account the scale and nature of the activities proposed, which are similar to current activities being undertaken at Rosyth dockyard, the SDP is not expected to result in a significant increase in energy use and emissions above current levels. The average daily temperature for Fife varies between an annual maximum temperature of 12.2°C and an annual minimum temperature of 4.9°C. These average temperatures also show daily and seasonal variations, with January being the coldest month, and July and August the hottest. Snow fall is normally confined to the months of November to April, with an average of 20 days snow fall along the coast per winter. Fife is susceptible to heavy rainfall and flooding, and has experienced a number of severe weather events typically storms and high winds, with the bridges to the peninsula susceptible to closure. Predictions of sea level rise for Fife have been made in a Proudman Oceanographic Laboratory publication (1997) of less than 1mm per year. The coastline along which Rosyth is situated is subjected to waves, tides, currents and meterological surges. Due to its coastal location, Rosyth dockyard is vulnerable to a number of extreme weather events, including storm surge and wind induced waves from high winds, hurricanes and tornadoes. SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Taking account of current flood risk to the dockyard SDP activities could be at significant risk of flooding, in particular during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes, or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. There is the potential for submarine transportation to and from Rosyth dockyard to be affected by climate change, in particular severe weather conditions such as a storm surge, wind induced waves, and tsunamis which may result in damage to the towing vessel, submarine or heavy lift vessel, disruption of activity, the potential mobilisation of pollutants and hazardous material, and in extreme circumstances sinking of the vessel. Heavy lift operations in particular would be more vulnerable to disruption from extreme weather conditions, due to the location of the heavy lift vessel within the estuary channel (which maybe relevant to the movement of the processed submarines).
H. Climate Change and Energy Use **Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.** **(continued)**	-/?	-/?	-/?	**Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 1D could therefore potentially have a greater impact on climate change and energy use associated with construction activities. Subsequent SDP activities undertaken at the Devonport and Rosyth dockyards would not differ and therefore there would be negligible difference in energy use and greenhouse gas emissions associated with SDP activities within the dockyards. Given that the majority of the Rosyth dockyard lies within the floodplain, the risk of SDP activities within the dockyards being adversely affected by climate change could be greater when compared to Devonport dockyard, of which only the fringe of the basin lies within a floodplain. Greenhouse gas emissions associated with transport would vary between the two dockyards. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Taking into account distance only,

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				greenhouse gas emissions associated with the transport of LLW from Devonport dockyard to the LLWR would be greater for Option 1D, although no significant impacts from LLW transportation are anticipated. In the case of Option 1D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 1R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Greenhouse gas emissions associated with submarine transportation could therefore be greater for Option 1R, although no significant impacts from submarine transportation are anticipated. As SDP activities at Rosyth dockyard are at greater risk of being adversely affected by climate change when compared to Devonport dockyard, *overall there is considered to be a greater potential for adverse impacts with Option 1R in relation to climate change and energy use*.
H. Climate Change and Energy Use **Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.** **(continued)**	-/?	-/?	-/?	**Combination Option** If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster draw down on the stock of laid-up submarines, which may reduce the potential for SDP activities to be affected by climate change (i.e. intensified weather events or sea level rise). In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.	-/?	-/?	-/?	**<u>Potential Effects</u>** SDP activities would generate CO_2 and greenhouse gas emissions and increase energy use when compared to the current baseline. The emission of CO_2 due to the direct or indirect combustion of fossil fuel from traffic and plant, any use of diesel generators, and the embodied carbon within construction materials used would contribute to climate change. Furthermore, the use of industrial process gases, such as oxyacetylene, in hot cutting will release CO_2 emissions. The removal of the RPV, reassembly of the submarine for transportation to the commercial ship recycling facility, and the subsequent full dismantling of the RPV following interim storage have the potential to be relatively energy intensive and result in direct and indirect greenhouse gas emissions. Estimated energy use associated with SDP activities are not available at this time; however there is not anticipated to be a substantial increase in energy expenditure and greenhouse gas emissions when compared to current levels at the Devonport and Rosyth dockyards and emissions are not anticipated to exceed permitted levels. Subsequent interim storage of the RPV is assumed to be a relatively passive activity and is not expected to be energy intensive. At this stage, construction material requirements, quantities and sourcing are unknown. Notwithstanding this, the SDP facilities are assumed to require construction materials with high embodied carbon values such as concrete, and steel. When considering the source of the material used, the distance and method of transportation would have a direct effect on overall carbon emissions (e.g. the different emissions associated with transport by road, rail or ship). Notwithstanding this, taking account of the scale of development and estimated transport movements for submarine transportation and transport of LLW and ILW and the timescales over which transport movements would occur, greenhouse gas emissions associated with transport are not anticipated to be significant when compared to current emissions from either Devonport or Rosyth. At both the Devonport and Rosyth dockyards there is the opportunity to transport materials by rail or sea. There may be some opportunity to implement energy efficiency measures and utilise low carbon sources when modifying existing facilities and constructing new facilities at the Devonport and Rosyth dockyards. There may also be the potential to reuse/recycle construction materials and material from dismantling, segregation and packaging activities. This would present an opportunity to save considerable energy. Given their locations, both the Devonport and Rosyth dockyards are vulnerable to coastal inundation or sea level rise related to climate change and extreme weather conditions, which may result in damage to facilities, disruption of activity and the potential mobilisation of pollutants and hazardous materials (*refer to impacts specific to the Devonport and Rosyth dockyards*). Although flood defence measures would be incorporated into SDP facility design, given the uncertain nature of climate change there is still the potential for an impact.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	Submarine transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility could also be affected by climate change, in particular extreme weather conditions *(refer to impacts specific to the Devonport and Rosyth dockyards).* Of the technical options, the scale of development required for the RPV option would be smaller than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2 and with a design that potentially requires the least resources to construct. For the RPV option emissions and energy use during construction could therefore be less when compared to the other technical options. In addition, in the case of this option, ILW would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the RPV. Overall, this option could therefore generate fewer emissions associated with transport when compared to those options proposing interim storage at a remote site.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				Total vehicle movements associated with radioactive waste transportation to the LLWR and proposed GDF (once full dismantling of the RPV has been completed) is expected to be the same across the technical options. However for the RPV option, the transport of ILW and the remaining LLW off-site would be delayed until after the interim storage period. During this delay there is the potential for more energy efficient vehicles or an increase in renewable fuels/electric vehicles which could decrease emissions, however this is very uncertain. In addition, as full dismantling would be deferred until after the interim storage period there is the potential for development of alternative less energy intensive techniques for RPV size reduction during this delay, which could reduce total greenhouse gas emissions. However, again this is very uncertain. <u>Devonport Dockyard</u> In 2008, electricity (non-operational) consumption at Devonport dockyard totalled 95GWh, a reduction of 3GWh compared to 2007 (98GWh in 2007). Devonport dockyard has been awarded the Carbon Trust Standard for reducing CO_2 emisisons. The permitted release allocation of CO_2 at Devonport dockyard is 19,225 tonnes of CO_2 for 2008-2012. In 2008, 19,225 tonnes of CO_2 was released at Devonport dockyard, a decrease of 1,914 tonnes of CO_2 compared to 2007 (21,139 tonnes in 2007). CO_2 released in 2008 is nearly 8,000 tonnes less than the maximum permitted by the EA. Potential energy use and emissions from SDP activities at Devonport dockyard are not known at this stage. However, taking into account the scale and nature of the activities proposed, which are similar to current activities being undertaken at Devonport dockyard, the SDP is not expected to result in a significant increase in energy use and emissions above current levels, and emissions are not anticipated to exceed permitted levels. The climate of the Plymouth area is temperate maritime with the prevailing wind direction from the south-west. The proximity of the English Channel mitigates the effect of any prolonged cold spells. Snowfall in the Plymouth area is on average 10 to 15 days per year and is usually not deep enough to be measured except for 2 to 3 days a year. Air temperatures less than 0°C are recorded on around 20 nights between October and May. Thunder occurs around 10 days per year (higher incidence in May and August than the rest of the year), with December and January generally receiving more rainfall than other months. Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Due to its coastal location, Devonport dockyard is vulnerable to a number of extreme weather events, including storm surge, wind induced waves from high winds, hurricanes and tornadoes, and tsunami (caused by seismic events on the sea floor west of Portugal).
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Taking account of current flood risk SDP activities within Devonport dockyard are not anticipated to be at significant risk of flooding. However, there could be the potential for impacts during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes, or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. There is the potential for submarine transportation to and from Devonport dockyard to be affected by climate change, in particular severe weather conditions such as a storm surge, wind induced waves, and tsunamis which may result in damage to the towing vessel, submarine, disruption of activity, the potential mobilisation of pollutants and hazardous materials, and in extreme circumstances sinking of the vessel. <u>Rosyth Dockyard</u> Potential energy use and emissions from SDP activities at Rosyth dockyard are not known at this stage. However, taking into account the scale and nature of the activities proposed,

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				which are similar to current activities being undertaken at Rosyth dockyard, the SDP is not expected to result in a significant increase in energy use and emissions above current levels. The average daily temperature for Fife varies between an annual maximum temperature of 12.2°C and an annual minimum temperature of 4.9°C. These average temperatures also show daily and seasonal variations, with January being the coldest month, and July and August the hottest. Snow fall is normally confined to the months of November to April, with an average of 20 days snow fall along the coast per winter. Fife is susceptible to heavy rainfall and flooding, and has experienced a number of severe weather events typically storms and high winds, with the bridges to the peninsula susceptible to closure. Predictions of sea level rise for Fife have been made in a Proudman Oceanographic Laboratory publication (1997) of less than 1mm per year. The coastline along which Rosyth is situated is subjected to waves, tides, currents and meterological surges. Due to its coastal location, Rosyth dockyard is vulnerable to a number of extreme weather events, including storm surge and wind induced waves from high winds, hurricanes and tornadoes. SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Taking account of current flood risk to the dockyard SDP activities could be at significant risk of flooding, in particular during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes, or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	There is the potential for submarine transportation to and from Rosyth dockyard to be affected by climate change, in particular severe weather conditions such as a storm surge, wind induced waves, and tsunamis which may result in damage to the towing vessel, submarine, disruption of activity, the potential mobilisation of pollutants and hazardous material, and in extreme circumstances sinking of the vessel. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 2D could therefore potentially have a greater impact on climate change and energy use associated with construction activities. Subsequent SDP activities undertaken at the Devonport and Rosyth dockyards would not differ and therefore there would be negligible difference in energy use and greenhouse gas emissions associated with SDP activities within the dockyards. Given that the majority of the Rosyth dockyard lies within the floodplain, the risk of SDP activities within the dockyards being adversely affected by climate change could be greater when compared to Devonport dockyard, of which only the fringe of the basin lies within a floodplain. Greenhouse gas emissions associated with transport would vary between the two dockyards. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Taking into account distance only, greenhouse gas emissions associated with the transport of LLW from Devonport dockyard to the LLWR would be greater for Option 2D, although no significant impacts from LLW transportation are anticipated. In the case of Option 2D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 2R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Greenhouse gas emissions associated with submarine transportation could therefore be greater for Option 2R, although no significant impacts from submarine transportation are anticipated.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				As the SDP activities undertaken at the dockyards would not differ there is not anticipated to be any significant difference in energy use and greenhouse gas emissions associated with SDP activities between the two dockyards, albeit that greenhouse gas emissions associated with LLW transportation could be greater for Devonport dockyard, and greenhouse gas emissions associated with submarine transportation could be greater for Rosyth dockyard, which are not anticipated to result in substantial greenhouse gas emissions. As SDP activities at Rosyth dockyard are at greater risk of being adversely affected by climate change when compared to Devonport dockyard, overall there is considered to be a greater potential for adverse impacts with Option 2R in relation to climate change and energy use.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster draw down on the stock of laid-up submarines, which may reduce the potential for SDP activities to be affected by climate change (i.e. intensified weather events or sea level rise). In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled.

Option 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.	-/?	-/?	-/?	<u>**Potential Effects**</u> SDP activities would generate CO_2 and greenhouse gas emissions and increase energy use when compared to the current baseline. The emission of CO_2 due to the direct or indirect combustion of fossil fuel from traffic and plant, any use of diesel generators, and the embodied carbon within construction materials used would contribute to climate change. Furthermore, the use of industrial process gases, such as oxyacetylene, in hot cutting will release CO_2 emissions. The removal of the RPV at the dismantling site, reassembly of the submarine for transportation to the commercial ship recycling facility, transportation of the RPVs to the remote site for interim storage, and the subsequent full dismantling of the RPV following interim storage have the potential to be relatively energy intensive and result in direct and indirect greenhouse gas emissions. Estimated energy use associated with SDP activities are not available at this time; however, there is not anticipated to be a substantial increase in energy expenditure and greenhouse gas emissions when compared to current levels at the Devonport and Rosyth dockyards and emissions are not anticipated to exceed permitted levels. Subsequent interim storage of the RPV is assumed to be a relatively passive activity and is not expected to be energy intensive. At this stage, construction material requirements, quantities and sourcing are unknown. Notwithstanding this, the SDP facilities are assumed to require construction materials with high embodied carbon values such as concrete, and steel. At both the Devonport and Rosyth dockyards there is the opportunity to transport materials for the construction of the dismantling facilities by rail or sea. When considering the source of the material used, the distance and method of transportation would have a direct effect on overall carbon emissions (e.g. the different emissions associated with transport by road, rail or ship). Notwithstanding this, taking account of the scale of development and estimated transport movements for submarine transportation and transport of LLW and ILW and the timescales over which transport movements would occur, greenhouse gas emissions associated with transport are not anticipated to be significant when compared to current emissions from either Devonport or Rosyth. At both the Devonport and Rosyth dockyards there is the opportunity to transport materials by rail or sea. There may be some opportunity to implement energy efficiency measures and utilise low carbon sources when modifying existing facilities and constructing new facilities at the Devonport and Rosyth dockyards and the commercial site. There may also be the potential to reuse/recycle construction materials and material from dismantling, segregation and packaging activities. This would present an opportunity to save considerable energy.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	Given their locations, both the Devonport and Rosyth dockyards are vulnerable to coastal inundation or sea level rise related to climate change and extreme weather conditions, which may result in damage to facilities, disruption of activity and the potential mobilisation of pollutants and hazardous materials (*refer to impacts specific to the Devonport and Rosyth dockyards*). Although flood defence measures would be incorporated into dismantling facility designs, given the uncertain nature of climate change there is still the potential for an impact. Submarine transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility could also be affected by climate change, in particular extreme weather conditions *(refer to impacts specific to the Devonport and Rosyth dockyards).* As a remote site for interim storage has not been identified at this stage it is unknown whether there would be any opportunity to transport the RPVs from the dismantling site to the remote site, or materials and wastes to and from the remote site, via rail or sea. Similarly, it is unknown whether interim storage and subsequent segregation/size reduction activities could be affected by climate change. Of the technical options, the scale of development required for the RPV option would be smaller than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2 and with a design that requires potentially the least resources to

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				construction. For the RPV option emissions and energy use during construction could therefore be less when compared to the other technical options. However, in the case of this option, following dismantling the RPVs would then be transported off the dismantling site to a remote site for interim storage. Overall, this option could therefore generate greater emissions associated with transport when compared to those options proposing dismantling with storage at point of waste generation. Total vehicle movements associated with packaged radioactive waste transportation to the LLWR and proposed GDF (once full dismantling of the RPV has been completed) is expected to be the same across the technical options. However for the RPV option, the transport of ILW and the remaining LLW (arising from RPV dismantling) off-site would be delayed until after the interim storage period. During this delay there is the potential for more energy efficient vehicles or an increase in renewable fuels/electric vehicles which could decrease emissions, however this is very uncertain. In addition, as full dismantling would be deferred until after the period of interim storage there is the potential for development of alternative less energy intensive techniques for RPV size reduction during this delay, which could reduce total greenhouse gas emissions. However, again this is very uncertain. <u>Devonport Dockyard</u> In 2008, electricity (non-operational) consumption at Devonport dockyard totalled 95GWh, a reduction of 3GWh compared to 2007 (98GWh in 2007). Devonport dockyard has been awarded the Carbon Trust Standard for reducing CO_2 emissions. The permitted release allocation of CO_2 at Devonport dockyard is 19,225 tonnes of CO_2 for 2008-2012. In 2008, 19,225 tonnes of CO_2 was released at Devonport dockyard, a decrease of 1,914 tonnes of CO_2 compared to 2007 (21,139 tonnes in 2007). CO_2 released in 2008 is nearly 8,000 tonnes less than the maximum permitted by the EA. Potential energy use and emissions from dismantling activities at Devonport dockyard are not known at this stage. However, taking into account the scale and nature of the activities proposed, which are similar to current activities being undertaken at Devonport dockyard, dismantling activities are not expected to result in a significant increase in energy use and emissions above current levels, and emissions are not anticipated to exceed permitted levels.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	The climate of the Plymouth area is temperate maritime with the prevailing wind direction from the south-west. The proximity of the English Channel mitigates the effect of any prolonged cold spells. Snowfall in the Plymouth area is on average 10 to 15 days per year and is usually not deep enough to be measured except for 2 to 3 days a year. Air temperatures less than 0°C are recorded on around 20 nights between October and May. Thunder occurs around 10 days per year (higher incidence in May and August than the rest of the year), with December and January generally receiving more rainfall than other months. Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Due to its coastal location, Devonport dockyard is vulnerable to a number of extreme weather events, including storm surge, wind induced waves from high winds, hurricanes and tornadoes, and tsunami (caused by seismic events on the sea floor west of Portugal). EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Taking account of current flood risk dismantling activities within Devonport dockyard are not anticipated to be at significant risk of flooding. However, there could be the potential for impacts during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes, or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. There is the potential for submarine transportation to and from Devonport dockyard to be

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				affected by climate change, in particular severe weather conditions such as a storm surge, wind induced waves, and tsunamis which may result in damage to the towing vessel, submarine, disruption of activity, the potential mobilisation of pollutants and hazardous materials, and in extreme circumstances sinking of the vessel. Rosyth Dockyard Potential energy use and emissions from SDP activities at Rosyth dockyard are not known at this stage. However, taking into account the scale and nature of the activities proposed, which are similar to current activities being undertaken at Rosyth dockyard, dismantling activities are not expected to result in a significant increase in energy use and emissions above current levels. The average daily temperature for Fife varies between an annual maximum temperature of 12.2°C and an annual minimum temperature of 4.9°C. These average temperatures also show daily and seasonal variations, with January being the coldest month, and July and August the hottest. Snow fall is normally confined to the months of November to April, with an average of 20 days snow fall along the coast per winter. Fife is susceptible to heavy rainfall and flooding, and has experienced a number of severe weather events typically storms and high winds, with the bridges to the peninsula susceptible to closure. Predictions of sea level rise for Fife have been made in a Proudman Oceanographic Laboratory publication (1997) of less than 1mm per year.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	The coastline along which Rosyth is situated is subjected to waves, tides, currents and meterological surges. Due to its coastal location, Rosyth dockyard is vulnerable to a number of extreme weather events, including storm surge and wind induced waves from high winds, hurricanes and tornadoes. SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Taking account of current flood risk to the dockyard SDP activities could be at significant risk of flooding, in particular during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes, or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. There is the potential for submarine transportation to and from Rosyth dockyard to be affected by climate change, in particular severe weather conditions such as a storm surge, wind induced waves, and tsunamis which may result in damage to the towing vessel, submarine, disruption of activity, the potential mobilisation of pollutants and hazardous material, and in extreme circumstances sinking of the vessel. **Comparison of the Options** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. Dismanstling activities undertaken at the Devonport and Rosyth dockyards would not differ and therefore there would be negligible difference in energy use and greenhouse gas emissions associated with SDP activities within the dockyards. Given that the majority of the Rosyth dockyard lies within the floodplain, the risk of dismantling activities within the dockyards being adversely affected by climate change could be greater at Rosyth dockyard when compared to Devonport dockyard, of which only the fringe of the basin lies within a floodplain. In the case of Option 3/4D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 3/4R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Greenhouse gas emissions associated with submarine transportation could therefore be greater for Option 3/4R, although no significant impacts from submarine transport are anticipated. As the SDP activities undertaken at the dockyards would not differ there is not anticipated to be any significant difference in energy use and greenhouse gas emissions associated with SDP activities between the two dockyards, albeit that greenhouse gas emissions associated with LLW transportation could be greater for Devonport dockyard, and greenhouse gas

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				emissions associated with submarine transportation could be greater for Rosyth dockyard, which are not anticipated to result in substantial greenhouse gas emissions. Overall, as SDP activities at Rosyth dockyard are at greater risk of being adversely affected by climate change when compared to Devonport dockyard, there is therefore considered to be a greater potential for adverse impacts with Option 3/4R in relation to climate change and energy use.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	At this stage a remote site for interim storage and size reduction has not been identified and subsequently the scale of potential energy use and emissions, and potential for these activities to affect and be affected by climate change is uncertain. The potential for effects would depend on the location of the remote site, the existing facilities and infrastructure in place, and the scale of development required. Combination Option If both the Devonport and Rosyth dockyards are utilised for dismantling, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites for dismantling would enable faster dismantling of submarines, which may reduce the potential for dismantling activities to be affected by climate change (i.e. intensified weather events or sea level rise). In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.	-/?	-/?	-/?	**Potential Effects** SDP activities would generate CO_2 and greenhouse gas emissions and increase energy use when compared to the current baseline. The emission of CO_2 due to the direct or indirect combustion of fossil fuel from traffic and plant, any use of diesel generators, and the embodied carbon within construction materials used would contribute to climate change. Furthermore, the use of industrial process gases, such as oxyacetylene, in hot cutting will release CO_2 emissions. The removal of the RPV, reassembly of the submarine for transportation to the commercial ship recycling facility, and the full dismantling of the RPV and the packaging of wastes have the potential to be relatively energy intensive and result in direct and indirect greenhouse gas emissions. Estimated energy use associated with SDP activities are not available at this time; however, there is not anticipated to be a substantial increase in energy expenditure and greenhouse gas emissions when compared to current levels at the Devonport and Rosyth dockyards and emissions are not anticipated to exceed permitted levels. Subsequent interim storage of the PW is assumed to be a relatively passive activity and is not expected to be energy intensive. At this stage construction material requirements, quantities and sourcing are unknown. Notwithstanding this, the SDP facilities are assumed to require construction materials with high embodied carbon values such as concrete, and steel. When considering the source of the material used, the distance and method of transportation would have a direct effect on overall carbon emissions (e.g. the different emissions associated with transport by road, rail or ship). Notwithstanding this, taking account of the scale of development and estimated transport movements for submarine transportation and transport of LLW and ILW and the timescales over which transport movements would occur, greenhouse gas emissions associated with transport are not anticipated to be significant when compared to current emissions from either Devonport or Rosyth. At both the Devonport and Rosyth dockyards there is the opportunity to transport materials by rail or sea.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	There may be some opportunity to implement energy efficiency measures and utilise low carbon sources when modifying existing facilities and constructing new facilities at the Devonport and Rosyth dockyards. There may also be the potential to reuse/recycle construction materials and material from dismantling, segregation and packaging activities. This would present an opportunity to save considerable energy. Given their locations, both the Devonport and Rosyth dockyards are vulnerable to coastal inundation or sea level rise related to climate change and extreme weather conditions, which may result in damage to facilities, disruption of activity and the potential mobilisation of pollutants and hazardous materials (*refer to impacts specific to the Devonport and Rosyth dockyards*). Although flood defence measures would be incorporated into SDP facility design, given the uncertain nature of climate change there is still the potential for an impact. Submarine transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility could also be affected by climate change, in particular extreme weather conditions *(refer to impacts specific to the Devonport and Rosyth dockyards).* Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new ILW storage area with a footprint of 1,005m^2. Due to its scale the PW option may require more resources for construction than the RPV option but fewer resources than that of the RC option and such as emissions and energy use during construction for the PW option could therefore be greater than the RPV option but less than the RC option. As the PW involves full early dismantling of the RPV and segregating the ILW and LLW

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				prior to interim storage, segregation is anticipated to be more energy intensive than the other technical options, as hot cutting would be required. In addition, for the PW option dismantling and segregation activities are anticipated to be more carbon intensive than the other technical options, as full dismantling of the RPV would take place immediately following RPV removal, whereas the RC and RPV options defer full dismantling until after interim storage and therefore would benefit from any future decarbonisation of electricity generation. In the case of this option, however, ILW would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the PW. Overall, this option would therefore generate fewer emissions associated with transport when compared to those options proposing interim storage at a remote site. Total vehicle movements associated with radioactive waste transportation to the LLWR and proposed GDF (once full dismantling of the RPV has been completed) is expected to be the same across the technical options. However for the PW option the transport of LLW and ILW off-site would be delayed until after the interim storage period. During this delay there is the potential for more energy efficient vehicles or an increase in renewable fuels/electric vehicles which could decrease emissions, although this is very uncertain. <u>Devonport Dockyard</u> In 2008, electricity (non-operational) consumption at Devonport dockyard totalled 95GWh, a reduction of 3GWh compared to 2007 (98GWh in 2007). Devonport dockyard has been awarded the Carbon Trust Standard for reducing CO_2 emisisons. The permitted release allocation of CO_2 at Devonport dockyard is 19,225 tonnes of CO_2 for 2008-2012. In 2008, 19,225 tonnes of CO_2 was released at Devonport dockyard, a decrease of 1,914 tonnes of CO_2 compared to 2007 (21,139 tonnes in 2007). CO_2 released in 2008 is nearly 8,000 tonnes less than the maximum permitted by the EA.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	Potential energy use and emissions from SDP activities at Devonport dockyard are not known at this stage. However, taking into account the scale and nature of the activities proposed, which are similar to current activities being undertaken at Devonport dockyard, the SDP is not expected to result in a significant increase in energy use and emissions above current levels, and emissions are not anticipated to exceed permitted levels. The climate of the Plymouth area is temperate maritime with the prevailing wind direction from the south-west. The proximity of the English Channel mitigates the effect of any prolonged cold spells. Snowfall in the Plymouth area is on average 10 to 15 days per year and is usually not deep enough to be measured except for 2 to 3 days a year. Air temperatures less than 0°C are recorded on around 20 nights between October and May. Thunder occurs around 10 days per year (higher incidence in May and August than the rest of the year), with December and January generally receiving more rainfall than other months. Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Due to its coastal location, Devonport dockyard is vulnerable to a number of extreme weather events, including storm surge, wind induced waves from high winds, hurricanes and tornadoes, and tsunami (caused by seismic events on the sea floor west of Portugal). EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Taking account of current flood risk SDP activities within Devonport dockyard are not anticipated to be at significant risk of flooding. However, there could be the potential for impacts during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes, or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. There is the potential for submarine transportation to and from Devonport dockyard to be

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				affected by climate change, in particular severe weather conditions such as a storm surge, wind induced waves, and tsunamis which may result in damage to the towing vessel, submarine, disruption of activity, the potential mobilisation of pollutants and hazardous materials, and in extreme circumstances sinking of the vessel. Rosyth Dockyard Potential energy use and emissions from SDP activities at Rosyth dockyard are not known at this stage. However, taking into account the scale and nature of the activities proposed, which are similar to current activities being undertaken at Rosyth dockyard, the SDP is not expected to result in a significant increase in energy use and emissions above current levels. The average daily temperature for Fife varies between an annual maximum temperature of 12.2°C and an annual minimum temperature of 4.9°C. These average temperatures also show daily and seasonal variations, with January being the coldest month, and July and August the hottest. Snow fall is normally confined to the months of November to April, with an average of 20 days snow fall along the coast per winter. Fife is susceptible to heavy rainfall and flooding, and has experienced a number of severe weather events typically storms and high winds, with the bridges to the peninsula susceptible to closure.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	Predictions of sea level rise for Fife have been made in a Proudman Oceanographic Laboratory publication (1997) of less than 1mm per year. The coastline along which Rosyth is situated is subjected to waves, tides, currents and meterological surges. Due to its coastal location, Rosyth dockyard is vulnerable to a number of extreme weather events, including storm surge and wind induced waves from high winds, hurricanes and tornadoes. Rosyth Dockyard SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Taking account of current flood risk to the dockyard SDP activities could be at significant risk of flooding, in particular during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes, or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. There is the potential for submarine transportation to and from Rosyth dockyard to be affected by climate change, in particular severe weather conditions such as a storm surge, wind induced waves, and tsunamis which may result in damage to the towing vessel, submarine, disruption of activity, the potential mobilisation of pollutants and hazardous material, and in extreme circumstances sinking of the vessel. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 6/8D could therefore potentially have a greater impact on climate change and energy use associated with construction activities when compared to Option 5R. Subsequent SDP activities undertaken at the Devonport and Rosyth dockyards would not differ and therefore there would be negligible difference in energy use and greenhouse gas emissions associated with SDP activities within the dockyards. Given that the majority of the Rosyth dockyard lies within the floodplain, the risk of SDP activities within the dockyard being adversely affected by climate change could be greater at Rosyth dockyard when compared to Devonport dockyard, of which only the fringe of the basin lies within a floodplain. Greenhouse gas emissions associated with transport would vary between the two dockyards. The Devonport and Rosyth dockyards are located approximately 385 miles and 175 miles respectively from the LLWR at Drigg by road. Taking into account distance only, greenhouse gas emissions associated with the transport of LLW from Devonport dockyard to the LLWR would be greater for Option 5D when compared to Option 5R, although no significant impacts from LLW transportation are anticipated.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	In the case of Option 5D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 5R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Greenhouse gas emissions associated with submarine transportation could therefore be greater for Option 5R, although no significant impacts from submarine transportation are anticipated. As the SDP activities undertaken at the dockyards would not differ there is not anticipated to be any significant difference in energy use and greenhouse gas emissions associated with SDP activities between the two dockyards, albeit that greenhouse gas emissions associated with LLW transportation could be greater for Devonport dockyard, and greenhouse gas emissions associated with submarine transportation could be greater for Rosyth dockyard, which are not anticipated to result in substantial greenhouse gas emissions. As SDP activities at Rosyth dockyard are at greater risk of being adversely affected by climate change when compared to Devonport dockyard, overall there is considered to be a greater potential for adverse impacts with Option 5R in relation to climate change and energy use. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the segregation facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster dismantling of submarines, which may reduce the potential for SDP activities to be affected by climate change (i.e. intensified weather events or sea level rise).

Options 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change.	-/?	-/?	-/?	**Potential Effects** SDP activities would generate CO_2 and greenhouse gas emissions and increase energy use when compared to the current baseline. The emission of CO_2 due to the direct or indirect combustion of fossil fuel from traffic and plant, any use of diesel generators, and the embodied carbon within construction materials used would contribute to climate change. Furthermore, the use of industrial process gases, such as oxyacetylene, in hot cutting will release CO_2 emissions. The removal and full dismantling of the RPV and the packaging of radioactive wastes at the dismantling site, reassembly of the submarine for transportation to the commercial ship recycling facility, transportation of the PW to the remote commercial site for interim storage, and the subsequent transport of PW to the proposed GDF for disposal following interim storage have the potential to be relatively energy intensive and result in direct and indirect greenhouse gas emissions. However, there is not anticipated to be a substantial increase in energy expenditure and associated greenhouse gas emissions when compared to current levels at the Devonport and Rosyth dockyards and emissions are not anticipated to exceed permitted levels. Subsequent interim storage of the RPV is assumed to be a relatively passive activity and is not expected to be energy intensive. At this stage, construction material requirements, quantities and sourcing is unknown. Notwithstanding this, the SDP facilities are assumed to require construction materials with high embodied carbon values such as concrete, and steel. When considering the source of the material used, the distance and method of transportation would have a direct effect on overall carbon emissions (e.g. the different emissions associated with transport by road, rail or ship). Notwithstanding this, taking account of the scale of development and estimated transport movements for submarine transportation and transport of LLW and ILW and the timescales over which transport movements would occur, greenhouse gas emissions associated with transport are not anticipated to be substantial when compared to current emissions from either Devonport or Rosyth. At both the Devonport and Rosyth dockyards there is the opportunity to transport materials for the construction of SDP facilities by rail or sea.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	There may be some opportunity to implement energy efficiency measures and utilise low carbon sources when modifying existing facilities and constructing new facilities at the Devonport and Rosyth dockyards and the remote site. There may also be the potential to reuse/recycle construction materials and material from dismantling, segregation and size reduction activities. This would present an opportunity to save considerable energy. Given their locations, both the Devonport and Rosyth dockyards are vulnerable to coastal inundation or sea level rise related to climate change and extreme weather conditions, which may result in damage to facilities, disruption of activity and the potential mobilisation of pollutants and hazardous materials (*refer to impacts specific to the Devonport and Rosyth dockyards*). Although flood defence measures would be incorporated into dismantling facility designs, given the uncertain nature of climate change there is still the potential for an impact. Submarine transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility could also be affected by climate change, in particular extreme weather conditions *(refer to impacts specific to the Devonport and Rosyth dockyards).* As a remote site for interim storage has not been identified at this stage it is unknown whether there would be any opportunity to transport the PW from the segregation/size reduction site to the remote site, or construction materials and wastes to and from the remote site, via rail or sea. Similarly, it is unknown whether interim storage activities could be affected by climate change. Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. Due to its scale the PW option may

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				require more resources for construction than the RPV option but fewer resources than that of the RC option and such as emissions and energy use during construction could therefore be greater than the RPV option but less than the RC option. As the PW involves full dismantling of the RPV prior to interim storage, size reduction is anticipated to be more energy intensive than the other technical options, as hot cutting would be required. In addition, for the PW option dismantling and size reduction activities are anticipated to be more carbon intensive than the other technical options, as full dismantling of the RPV would take place immediately following RPV removal, whereas the RC and RPV options defer full dismantling until after interim storage and therefore would benefit from any future decarbonisation of electricity generation. In the case of this option, following full dismantling of the RPV, the PW would be transported off the size reduction site to a remote site for interim storage. Overall, this option could therefore generate greater emissions associated with transport when compared to those options proposing dismantling with storage at point of waste generation. Total vehicle movements associated with packaged radioactive waste transportation to the LLWR and proposed GDF (once full dismantling of the RPV has been completed) is expected to be the same across the technical options. However, for the PW option there is less potential for more energy efficient vehicles or an increase in renewable fuels/electric vehicles to arise which could decrease emissions. <u>Devonport Dockyard</u> In 2008, electricity (non-operational) consumption at Devonport dockyard totalled 95GWh, a reduction of 3GWh compared to 2007 (98GWh in 2007). Devonport dockyard has been awarded the Carbon Trust Standard for reducing CO_2 emissions. The permitted release allocation of CO_2 at Devonport dockyard is 19,225 tonnes of CO_2 for 2008-2012. In 2008, 19,225 tonnes of CO_2 was released at Devonport dockyard, a decrease of 1,914 tonnes of CO_2 compared to 2007 (21,139 tonnes in 2007). CO_2 released in 2008 is nearly 8,000 tonnes less than the maximum permitted by the EA.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	Potential energy use and emissions from dismantling activities at Devonport dockyard are not known at this stage. However, taking into account the scale and nature of the activities proposed, which are similar to current activities being undertaken at Devonport dockyard, dismantling activities are not expected to result in a significant increase in energy use and emissions above current levels, and emissions are not anticipated to exceed permitted levels. The climate of the Plymouth area is temperate maritime with the prevailing wind direction from the south-west. The proximity of the English Channel mitigates the effect of any prolonged cold spells. Snowfall in the Plymouth area is on average 10 to 15 days per year and is usually not deep enough to be measured except for 2 to 3 days a year. Air temperatures less than 0°C are recorded on around 20 nights between October and May. Thunder occurs around 10 days per year (higher incidence in May and August than the rest of the year), with December and January generally receiving more rainfall than other months. Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Due to its coastal location, Devonport dockyard is vulnerable to a number of extreme weather events, including storm surge, wind induced waves from high winds, hurricanes and tornadoes, and tsunami (caused by seismic events on the sea floor west of Portugal). EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Taking account of current flood risk dismantling activities within Devonport dockyard are not anticipated to be at significant risk of flooding. However, there could be the potential for impacts during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes, or an exceptionally severe localised rainstorm with a very high return period that resulted in a

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. There is the potential for submarine transportation to and from Devonport dockyard to be affected by climate change, in particular severe weather conditions such as a storm surge, wind induced waves, and tsunamis which may result in damage to the towing vessel, submarine, disruption of activity, the potential mobilisation of pollutants and hazardous materials, and in extreme circumstances sinking of the vessel. Rosyth Dockyard Potential energy use and emissions from SDP activities at Rosyth dockyard are not known at this stage. However, taking into account the scale and nature of the activities proposed, which are similar to current activities being undertaken at Rosyth dockyard, dismantling activities are not expected to result in a significant increase in energy use and emissions above current levels. The average daily temperature for Fife varies between an annual maximum temperature of 12.2°C and an annual minimum temperature of 4.9°C. These average temperatures also show daily and seasonal variations, with January being the coldest month, and July and August the hottest. Snow fall is normally confined to the months of November to April, with an average of 20 days snow fall along the coast per winter. Fife is susceptible to heavy rainfall and flooding, and has experienced a number of severe weather events typically storms and high winds, with the bridges to the peninsula susceptible to closure.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	Predictions of sea level rise for Fife have been made in a Proudman Oceanographic Laboratory publication (1997) of less than 1mm per year. The coastline along which Rosyth is situated is subjected to waves, tides, currents and meterological surges. Due to its coastal location, Rosyth dockyard is vulnerable to a number of extreme weather events, including storm surge and wind induced waves from high winds, hurricanes and tornadoes. SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Taking account of current flood risk to the dockyard SDP activities could be at significant risk of flooding, in particular during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes, or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. There is the potential for submarine transportation to and from Rosyth dockyard to be affected by climate change, in particular severe weather conditions such as a storm surge, wind induced waves, and tsunamis which may result in damage to the towing vessel, submarine, disruption of activity, the potential mobilisation of pollutants and hazardous material, and in extreme circumstances sinking of the vessel. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 6D could therefore potentially have a greater impact on climate change and energy use associated with construction activities within the dockyard. Subsequent SDP activities undertaken at the Devonport and Rosyth dockyards would not differ and therefore there would be negligible difference in energy use and greenhouse gas emissions associated with SDP activities within the dockyards. Given that the majority of the Rosyth dockyard lies within the floodplain, the risk of dismantling activities being adversely affected by climate change could be greater at Rosyth dockyard when compared to Devonport dockyard, of which only the fringe of the basin lies within a floodplain. In the case of Option 6/8, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 6/8R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Greenhouse gas emissions associated with submarine transportation could therefore be greater for Option 6/8R, although no significant impacts from submarine transportation are anticipated.
H. Climate Change and Energy Use Reduce energy consumption, minimise detrimental effects on the climate from greenhouse gases and maximise resilience to climate change. *(continued)*	-/?	-/?	-/?	As the SDP activities undertaken at the dockyards would not differ there is not anticipated to be any significant difference in energy use and greenhouse gas emissions associated with SDP activities between the two dockyards, albeit that greenhouse gas emissions associated with LLW transportation could be greater for Devonport dockyard, and greenhouse gas emissions associated with submarine transportation could be greater for Rosyth dockyard, which are not anticipated to result in substantial greenhouse gas emissions. Overall, as SDP activities at Rosyth dockyard are at greater risk of being adversely affected by climate change when compared to Devonport dockyard, there is therefore considered to be a greater potential for adverse impacts with Option 6/8R in relation to climate change and energy use. At this stage a remote site for interim storage has not been identified and subsequently the scale of potential energy use and emissions, and potential for these activities to affect and be affected by climate change is uncertain. The potential for effects would depend on the location of the remote site, the existing facilities and infrastructure in place, and the scale of development required. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined. However, it is noted that as submarine dismantling activities would be undertaken on three different sites (initial dismantling of the RPV taking place at one dockyard, and full size reduction of the RPV taking place at the other dockyard and interim storage of the PW at a remote site), this combination option could result in a greater number of transport movements compared to Options 6/8D and 6/8R. Greenhouse gas emissions and energy use associated with transport could therefore be greater for Option 6/8B.

A9. Coastal Change and Flood Risk

9.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on coastal change and flood risk. Information is presented for both national and sub-regional levels.

Coastal change in this context has been defined narrowly to include coastal processes coastal erosion. Flood risk within this context is defined as the risk of coastal, river, surface water, sewer and groundwater flooding. Water quality is covered under the water quality and resources section.

There are links between the coastal change and flood risk topic and other SEA topics, specifically water quality and resources, and climate change and energy use.

9.2 Summary of Plans and Programmes

9.2.1 International

The ***EU Floods Directive (2007)*** entered into force on 26 November 2007. The Directive requires Member States to review all watercourses and coastlines to assess the risk from flooding, to map the flood extent and the population and assets at risk in these areas. Beyond this, the Directive requires Member States to take adequate and coordinated measures to reduce this flood risk. The Directive also reinforces the rights of the public to access this information and to be involved in the planning process. The Flood Directive is linked to the ***EU Water Framework Directive (2000)*** and requires flood risk appraisals to be produced at a River Basin District scale and working with the timing of the Water Framework Directive (WFD) River Basin Planning cycles, with the first key reporting deadline in 2013.

The ***Marine Strategy Framework Directive (2008)*** requires Member States to take the necessary measures to achieve or maintain good environmental status in the marine environment by 2020 at the latest through the development and implementation of marine strategies.

9.2.2 National

UK

The Marine Strategy Framework Directive has been transposed into UK law through the ***Marine Strategy Regulations (2010)***. It aims to achieve good environmental status of the EU's marine waters by 2021 and to protect the resource base upon which marine-related economic and social activities depend.

The ***Marine and Coastal Access Act (2009)*** seeks to implement the ***Marine Strategy Framework Directive (2008)*** which requires Member States to co-ordinate activities in the marine regions. The Act comprises several key elements or parts. In relation to coastal processes (in the context of this report), three elements are particularly pertinent. First, the Act allows for the creation of a Marine Management Organisation (MMO) to deliver marine functions in the waters around England and in the UK offshore area (for matters that are not devolved). Second, the Act creates a new UK-wide strategic marine planning system to enable more strategic and effective management of seas includes the creation of a ***Marine Policy Statement (MPS)*** which was completed in 2011 and sets both long and short term objectives for the sustainable use of the marine environment together with regional/local marine plans which will implement the policy statement in specific areas. Third, the Act makes changes to the marine licensing system that will result in more consistent licensing decisions for marine works and activities

Shoreline Management Plans (SMP) provide a large scale assessment of the risks associated with coastal processes and present a long term policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner. An SMP is a high level document that forms an important element of the strategy for flood and coastal erosion risk management. The first generation of SMPs produced over the last 10 years are now due for review to ensure that full account is taken of latest information and future challenges.

The ***Flood and Water Management Act (2010)*** aims to provide better, more comprehensive management of flood risk for people, homes and businesses. Key objectives include:

- To give the Environment Agency an overview of all flood and coastal erosion risk management and unitary and county councils the lead in managing the risk of all local floods.
- To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SUDS for new developments and redevelopments.
- To enable water and sewerage companies to operate concessionary schemes for community groups on surface water drainage charges.

A draft ***National Policy Statement for Ports*** was produced in 2009. This document sets out a consultation draft of the (previous) Government's policy toward nationally significant infrastructure proposals for port development in England and Wales.

England and Wales

As much of the implementation work related to the Water Framework Directive and Flood Directive, including Shoreline Management Plans is undertaken by the Environment Agency, whose remit spans both England and Wales, much of the available coastal change and flood risk data covers both administrations. For this reason England and Wales are considered collectively in this chapter.

England

Planning Policy Statement 25 (PPS25): Development and Flood Risk sets out Government policy on development and flood risk. It aims to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, to direct development away from areas of highest risk, and to prevent new development increasing flood risk. Where new development is, exceptionally, necessary in such areas, the policy aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall. PPS25 ensures that many of the requirements of the EU Floods Directive are already being delivered in England.

Making Space for Water sets out the cross Government, overarching strategy for flood and coastal erosion risk management in England. The Government's strategy for water in England, ***Future Water*** reaffirms Making Space for Water as the basis for managing river and coastal flooding. However, it also sets out a vision for better management of surface water to address the dual pressures of climate change and housing development. The strategy sets out 77 immediate actions required to meet a range of strategic objectives grouped into themes including 'River and Coastal Flooding'. Relevant objectives include that by 2030 at the latest, we have:

- sustainably managed risks from flooding and coastal erosion, with greater understanding and more effective management of surface water; and
- cut greenhouse gas emissions; and embedded continuous adaptation to climate change and other pressures across the water industry and water users.

The Government is also currently preparing the revision to ***PPG20: Coastal Planning*** and recently consulted on planning policy in respect to development and coastal change[67] which seeks to:

[67] CLG (2009) Planning Policy Consultation: Consultation paper on a new planning policy on Development and coastal change

- Promote sustainable development by ensuring that decisions are based on an understanding of coastal change over time and the social and economic benefits of particular types of development;
- Prevent new development from being put at risk from coastal change by avoiding inappropriate development in areas that are vulnerable to coastal change or any development that adds to the impacts of physical changes to the coast, and by enabling appropriate development (development that requires a coastal location and/or provides substantial economic and social benefits to communities); and
- Reduce the risk facing coastal communities already at threat from coastal change by ensuring that plans are in place to manage their future development through adaptation, for example, by improving their resilience or by relocation.

Wales

Planning Policy Wales (PPW) sets out the need to move away from flood defence and the mitigation of the consequences of new development in areas of flood hazard towards a more positive avoidance of development in areas defined as being of flood hazard. In terms of coastal development, PPW states that, before major developments are permitted, it will be essential to demonstrate that a coastal location is required. Where development is considered to satisfy this test it should be designed so as to be resilient to the effects of climate change over its lifetime.

Technical Advice Note 15 (TAN15) sets out a precautionary framework to guide planning decisions. The approach seeks to first, direct new development away from those areas which are at high risk of flooding and, second, where development has to be considered in high risk areas, allow only those developments which can be justified to be located within such areas. ***TAN14*** on coastal planning aims to protect the coastline in relation to development, landscape, biodiversity and recreation.

The ***Integrated Coastal Zone Management (ICZM) Strategy for Wales (2007)*** recognises that the greatest challenge facing Wales' coastal areas is that posed by climate change, with the threat of sea level rise and increased incidence of coastal flooding among the expected effects. To address the risk of an increase in stormy weather due to climate change the Welsh Assembly Government are moving away from the traditional approach of building more and higher defences to one of managing the risk. Greater emphasis is being placed on understanding the flood risk and raising awareness of those at risk of the consequences they face. A set of Shoreline Management Plans has been completed for strategic sections of Wales' coast, identifying policy options for their future management. These will be updated in future to take account of the latest trends and evidence on flooding. A number of objectives relating to the implementation of ICZM are set out.

Scotland

Scottish Planning Policy (SPP) (2010) sets out the Scottish Government's policy on land use planning. The key aims of SPP in relation to flooding are:

- to prevent developments which would be at significant risk of being affected by flooding;
- to prevent developments which would increase the probability of flooding elsewhere; and
- to provide a basis for planning decision making related to flood risk, the SPP provides a risk framework which divides flood risk into three categories and outlines an appropriate planning response.

With regard to flood risk, SPP states that developers and planning authorities should take a precautionary approach in taking decisions when flood risk is an issue and that development should not take place on land that could otherwise contribute to managing flood risk, for instance through managed coastal realignment, washland creation or as part of a scheme to manage flood risk. With respect to coastal issues, SPP states that planning authorities should take the likely effect of proposed development on the marine environment into account when preparing when making decisions on planning applications. The SPP also notes that the risks associated with rising sea levels and coastal flooding should be taken into account when identifying areas that are suitable for development.

The ***Flood Risk Management (Scotland) Act 2009*** includes a duty placed upon Scottish Ministers, SEPA, local authorities, Scottish Water and other responsible authorities to exercise their functions with a view to managing and reducing flood risk and to promote sustainable flood risk management.

Northern Ireland

Planning Policy Statement 15: Planning and Flood Risk (PPS15) sets out the Department of Environment Northern Ireland's planning policies to minimise flood risk to people, property and the environment. The primary aim of ***PPS15*** is to prevent future development that may be at risk from flooding or that may increase the risk of flooding elsewhere.

The ***Water Environment (Floods Directive) Regulations (Northern Ireland) (2009)*** transposes the Flood Directive into Northern Ireland legislation.

9.2.3 Sub-regional locations

Plymouth

The ***Lyme Bay and South Devon Shoreline Management Plan (SMP)*** and ***Durlston Head to Portland Bill SMP*** were produced in 1998 and set out sustainable coastal defence strategies for the future management of the shorelines between Durlston Head to Portland Bill, and between Portland Bill in Dorset and Rame Head in Cornwall respectively. The SMPs set out a number of objectives for the sustainable management of these shorelines and identified coastal defence management policies based upon original guidance from MAFF for a 50-year period. Since completion of these SMPs, a number of studies and schemes have been developed based upon the recommended policies. The outcomes of these studies have been used to inform the development of a combined ***South Devon and Dorset Shoreline Management Plan (consultation draft),*** which will provide the management plan for the next 100 years and the policies required for it to be implemented.

Flood risk policy for Plymouth is set out within the ***Plymouth Core Strategy - Policy CS21 (Flood Risk).*** The policy states that the council will support development proposals that avoid areas of current or future flood risk, and which do not increase the risk of flooding elsewhere. This will involve a risk based sequential approach to determining the suitability of land for development. Development in high risk flood areas will only be permitted where it meets the certain prerequisites. In addition, development will be required to incorporate Sustainable Drainage Systems to manage surface water drainage.

Plymouth's ***Strategic Flood Risk Assessment*** aims to ensure that Plymouth City Council meets its obligations under current planning guidance and to provide a reference and policy document to inform local planning policy.

The ***Tamar Catchment Flood Management Plan (2009)*** identifies flood risk management policies to assist all key decision makers in the catchment, which are aimed at delivering sustainable flood risk management for the long term.

Fife

Policy SSI: Settlement Development Strategy of the Fife Structure Plan 2006-2026, sets out the sustainable development strategy for Fife. Under Policy SS1, in identifying sites for development in Local Plans, and in the assessment of other proposals, the Council will have regard to the avoidance of development in areas at risk of flooding and/or coastal erosion.

The ***Fife Shoreline Management Plan (1999)*** sets out Fife Council's policies for managing the Fife coastline. A review of the existing plan is currently being undertaken, which will assess the risks from coastal erosion and flooding, and make allowance for the predicted effects of climate change. The project will deliver a new SMP, which will detail sustainable coastline management policies over the next 20, 50 and 100 years, along with an action plan to deliver the objectives over the life of the SMP.

9.3 Overview of the Baseline

9.3.1 National

UK

Coastal erosion is occurring along 17% of the UK coastline[68]. Sea levels are rising, and are greater in the south of the UK than the north. The global-average sea level rose during the 20th century at an average rate of 1-2 mm/year, with some consensus on the larger value by the research community. The rate was larger (approximately 3mm/year) during the 1990s. UK sea level records are consistent with these values but with smaller trends observed in Scotland (where the land is uplifting) than in the south of the UK.[69]

England and Wales

In 2009, an estimated 2.7 million properties in England and Wales were in areas deemed to be at risk of flooding. Of these, some 580,000 were where the risk of flooding was greater than a 1 in 75 chance in any year. ('Risk' is the likelihood of flooding occurring given existing flood defences - not the extent to which flooding may cause damage).[70] Coastal erosion is occurring along 30% of England's and 23% of Wales' coastline[71]. Of the regions in England, Yorkshire and Humber has the greatest proportion of coastal length which is eroding at 56% (203km). Coastal erosion is occurring along 30% to 32% of the South East, South West and East Midlands coastlines whilst 27% and 18% of the North East and North West coastlines respectively are eroding. The East Midlands has the smallest proportion of coastal length which is eroding at 9% or 21km.[72]

Regionally, Greater London has the highest number of people at risk from flooding, with around 542,000 properties and one million people located in the floodplain. However, although London does have the largest number of people at risk, 84% are in areas with a low chance of flooding. This is mainly due to the major flood defences and flood defence structures in the Thames Estuary, including the Thames

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68 Marine Climate Change Partnerships website coastal erosion, http://www.mccip.org.uk/annual-report-card/2007-2008/marine-environment/coastal-erosion.aspx
69 Marine Climate Change Partnerships website sea level, http://www.mccip.org.uk/annual-report-card/2007-2008/marine-environment/sea-level.aspx
70 Defra (2010) Measuring Progress - Sustainable Development Indicators 2010
71 Marine Climate Change Partnerships website coastal erosion, http://www.mccip.org.uk/annual-report-card/2007-2008/marine-environment/coastal-erosion.aspx
72 Marine Climate Change Partnerships website coastal erosion, http://www.mccip.org.uk/annual-report-card/2007-2008/marine-environment/coastal-erosion.aspx

Barrier. The City of Kingston-upon-Hull and East Riding in Yorkshire are the two local authorities with the highest number of properties with a chance of flooding. However, other local authorities, such as Boston and North Somerset, have a higher share of properties in areas of significant flood risk. For instance, Boston has about two-thirds of its properties in areas with a significant chance of flooding.[73]

Over 220,000 properties in Wales are at risk from river and sea flooding, of which 64,000 are at significant risk (greater than a one in 75 chance in any year). Across the local authorities in Wales, Cardiff has the highest numbers of properties at risk from flooding from rivers or the sea. However, many of these are at low risk (less than one in 200 chance in any given year), mainly because of the flood defence structures in place in Cardiff. Although Cardiff is well defended, if these defences were to be overtopped then the consequences could be severe. Conwy has the largest number of properties at significant risk (greater than a 1 in 75 chance in any given year). This is largely because of the coastal flood risk. Coastal flooding is also the cause of the significant risk to property in Gwynedd and Newport.[74]

Scotland

Coastal erosion is occurring along 12% of the Scottish coastline.[75]

In Scotland, an estimated 99,000 properties (around 3.9% of all properties) lie in areas at high to medium risk of flooding (i.e. areas where the risk of flooding is greater than a 1 in 200 annual probability) with 26,000 at risk from the sea and 73,000 at risk from rivers.[76]

Northern Ireland

Coastal erosion is occurring along 20% of Northern Ireland's coastline.[77]

It is estimated that some 60,000 properties in Northern Ireland are at risk from flooding from an event with a one in 100 chance of occurrence in any one year. Nearly 14,000 of these are situated within the Greater Belfast Area.

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[73] Environment Agency, 2009, Flooding in England: A National Assessment of Flood Risk
[74] Environment Agency Wales, 2009, Flooding in Wales: A National Assessment of Flood Risk
[75] Marine Climate Change Partnerships website coastal erosion, http://www.mccip.org.uk/annual-report-card/2007-2008/marine-environment/coastal-erosion.aspx
[76] Scottish Government, Flood Risk Responsibilities, http://www.scotland.gov.uk/Resource/Doc/921/0052798.doc
[77] Marine Climate Change Partnerships website coastal erosion, http://www.mccip.org.uk/annual-report-card/2007-2008/marine-environment/coastal-erosion.aspx

9.3.2 Sub-regional locations

Plymouth

In Plymouth, the main sources of flooding are from direct flooding caused by tide/waves and indirect flooding caused by the tide submerging drainage outlets. A significant amount of flooding in Plymouth is caused by ineffective drainage and insufficient sewer capacity. Areas in Flood Zone 3 extend along the western, southern and eastern waterfronts of the city.[78]

There is a recorded history of flooding within the Tamar catchment from a range of sources – rivers, the estuaries, surface water run-off and sewer systems. The estuaries contribute to flood risk in the Tamar catchment, making flooding from the rivers worse when high tides coincide with high rainfall. There are over 90km of flood defences in place throughout the catchment; however, over 1600 properties in Plymouth are either at 1% risk every year from river flooding, or at 0.5% risk every year from tidal flooding[79]. After many decades of decline Plymouth is promoting a high profile waterfront regeneration vision to attract inward investment and economic development of the city. Dealing with tidal flood risk is an important consideration.[80]

Fife

In 2006, 0.8% of dwellings were within a coastal flood risk area.[81] The Indicative River & Coastal Flood Map (Scotland) shows that Rosyth dockyard lies within the 1 in 200 year (0.5% annual probability) flood envelope, highlighting that the dockyard may be at medium to high risk of coastal flooding.[82]

Approximately 3% of dwellings in Fife are within a fluvial flood risk area.[83]

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[78] Plymouth City Council, Strategic Flood Risk Assessment, R02701R001/Final Draft http://www.plymouth.gov.uk/homepage/environmentandplanning/planning/planningpolicy/ldf/ldfbackgroundreports/bfloodriskassessment.htm
[79] Tamar Catchment Management Plan; http://publications.environment-agency.gov.uk/pdf/GESW1109BOUP-e-e.pdf
[80] http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/southwest/Intro.aspx
[81] Scottish Neighbourhood Statistics, Fife, http://www.sns.gov.uk/AnRep/AreaTree.asp
[82] SEPA, Indicative River & Coastal Flood Map, http://go.mappoint.net/sepa/
[83] Scottish Neighbourhood Statistics, Fife, http://www.sns.gov.uk/AnRep/AreaTree.asp

9.4 Existing problems

9.4.1 National

UK

Sea levels are rising, with worst case scenarios of a 1.9m increase in sea level by 2100 (with up to 0.76m more likely). The south and east of England will experience the greatest effective increases, due to the effects of post-glacial rebalancing.

Many coastal sites (especially in the south and east of the country) are already prone to erosion, due to their underlying geology, coupled with rising sea levels and increased storm intensity.

Increasing development pressures on and around the coastal environment (often accompanied by coastal engineering projects such as sea defences) are conflicting with the need for their effective management in the face of climate change. SMPs and CMPs are being implemented across the country to assess and manage these risks.

9.4.2 Sub-regional locations

Plymouth

The main pressures on South West estuaries and coasts are pollution from industrial discharges, nutrient and microbiological contamination from run-off and sewage, sea level rise leading to coastal squeeze and potential over-exploitation of fisheries[84]. The biggest direct negative effect on Plymouth from climate change would be rising sea levels and consequent flooding.[85]

A significant amount of flooding in Plymouth is caused by ineffective drainage and insufficient sewer capacity. High-risk areas (Flood Zone 3 in PPS25) extend along the western side of the city. Plymouth is likely to be affected by rising sea levels and subsequent flooding.

[84] http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/southwest/Intro.aspx

[85] Plymouth 2020 Environment & Sustainability Partnership Climate Change Impacts and Implications fro Plymouth, 2004.

Fife

Fife has a relatively long coastline and therefore many areas are at risk from rising sea levels and increased storm surges[86].

In Fife, most watercourses are small and fast flowing, and flooding is usually caused by short-duration, intense rainfall. Of the two larger rivers in Fife (the Leven and Eden), the Eden is historically subject to significant flooding from long duration rainfall, whilst the Leven shows little tendency to flood. Tidal flooding is an issue along Fife's coastline.[87]

9.5 Likely evolution of the baseline

9.5.1 National

UK

Climate change is likely to exacerbate erosion and coastal flooding as a result of sea level rise together with the potential increase in the intensity, severity and frequency of coastal storms over the next 100 years. The third assessment of the Intergovernmental Panel on Climate Change (IPCC) presented a range of projected sea-level rise between 1990 and 2100 of 9-88cm. The most recent information for the UK from the UK Climate Impacts Programme (UKCIP) forecasts a range of relative sea level rise by the 2080s (relative to the 1961-1990 mean) of between 20 and 80cm in south-west England and 0 and 60cm in Scotland.[88]

The scenarios in UKCIP 09 lead to several predictions relevant to flooding:

- Annual average precipitation across the UK may decrease by between 0% and 15% by the 2080s, depending on the scenario.
- The seasonal distribution of precipitation will change. Winters will become wetter and summers drier. The biggest relative changes will be in the south and east. Under the High emissions scenario, winter precipitation in the south-east may increase by up to 30% by the 2080s.
- By the 2080s, the daily precipitation intensities that are experienced once every two years on average may become up to 20% heavier. The scenarios give no guidance on the effects of climate change on more extreme precipitation events.

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[86] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1
[87] Fife Council, Flood Alleviation Report, 2007, http://www.fifedirect.org.uk/uploadfiles/publications/c64_FifeFloodAlleviationReport2007.pdf
[88] UKCIP website, http://www.ukcip.org.uk/resources/publications/documents/124.pdf

- By the 2080s, depending on scenario, relative sea level may be between 2cm below and 58cm above the current level in western Scotland and between 26 and 86cm above the current level in south-east England.
- For some coastal locations, a water level that at present has a 2% annual probability of occurrence may have a 33% annual probability by the 2080s for Medium High emissions. [89]

England and Wales

In England and Wales, forecasts suggest that there will be considerable variation in erosion rates, both between and within regions. Many areas will experience little or no erosion of shorelines while others experience erosion of several hundred metres. Future erosion will be consistently severe on the east coast and major estuaries such as the Severn, Thames and Humber. As the erosion rates will (to first order) depend on the climate, although the national value of built assets directly at risk from coastal erosion is substantially lower than those at risk from coastal flooding, coastal flood risk is itself heavily influenced by the rate of coastal change.[90]

Almost two-thirds of the intertidal profiles in England and Wales have steepened over the past hundred years, a process which is particularly prevalent on coasts protected by hard engineering structures (this represents 46% of England's coastline; 28% of Wales; 20% of Northern Ireland and 7% Scotland). Both coastal erosion and steepening of intertidal profiles effects are expected to increase in the future due to the effects of climate change, especially sea-level rise and changes to the wave conditions.[91]

The total number of properties in England and Wales at risk of flooding saw an apparent increase of 23% between 2004 and 2009. However, with improvements to data collection methodology; revisions to modelling techniques; and reduced flood risks resulting from flood management works, year on year changes should be interpreted with caution.

Scotland

Until recent years, the risk posed by coastal flooding has attracted less attention in Scotland compared to other parts of the UK, in part this was because it was thought to be relatively low risk and unlikely to generate significant economic losses. As a result records of coastal change and flood risk are less well established in Scotland than England and Wales. However, as the frequency and severity of coastal

[89] UK Department of Business Innovation and Skills Website, the Foresight Project, http://www.bis.gov.uk/assets/bispartners/foresight/docs/flood-and-coastal-defence/vol1chapter1.pdf

[90] UK Department of Business Innovation and Skills Website, the Foresight Project, http://www.bis.gov.uk/assets/bispartners/foresight/docs/flood-and-coastal-defence/vol1chapter6.pdf

[91] Marine Climate Change Partnerships website, http://www.mccip.org.uk/annual-report-card/2007-2008/marine-environment/coastal-erosion.aspx

flooding appears to be increasing risks associated with coastal flooding are beginning to attract similar levels of interest as river based and pluvial flooding in cities.[92] For example, Scottish Natural Heritage is undertaking various research projects into coastal climate change, many of which will consider relative sea-level rise and its impacts.[93]

On average coastal floods have occurred once or twice a year based with a seasonal peak in winter (especially in January or February). The North Atlantic Oscillation (NAO) (the difference in sea level atmospheric pressure between the Azores and Iceland) is a major driver for storms and coastal floods in the North Atlantic. Positive values of the NAO index are associated with higher incidence of coastal floods in Scotland. As it is likely that NAO will become more positive by 2080 the frequency of coastal flooding may also increase.[92]

It is also recognised that urban development is placing greater demands on urban drainage systems. Flooding due to loss of floodplains from agriculture is manageable under current and new policies.[94]

Northern Ireland

Likewise to the rest of the UK it is expected that climate change and increasing development is likely to increase the frequency and severity of coastal flooding and erosion.

In order to prepare for increases in flooding as a requirement of the Water Environment Regulations a Preliminary Flood Risk Assessment of all river basins and coastal zones in the Northern Ireland will be completed by December 2011 in order to identify areas that are at a potential risk of significant flooding. For those areas that are identified as potentially being at significant risk Flood Hazard Maps and Flood Risk maps will be produced by 2013 and Flood Risk Management Plans will be produced by 2015.

9.5.2 Sub-regional locations

Plymouth

Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th century[95], and there are indications that the increase has been at a faster rate than

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[92] SNIFFER (2008) http://www.sniffer.org.uk/Webcontrol/Secure/ClientSpecific/ResourceManagement/UploadedFiles/FRM10%20final%20030908%20with%20security.pdf

[93] Scottish National Heritage http://www.snh.gov.uk/about-scotlands-nature/rocks-soils-and-landforms/coasts/sea-levels/ (accessed 09/06/11)

[94] SNIFFER (2009) Current environmental baseline and trends for water - SCOTLAND http://www.seaguidance.org.uk/Upload/Documents/L3EX2CurrentstateandtrendsforWATERSCOT.PDF

[95] Proudman Oceanographic Laboratory

this in the 1990s and 2000s. The nature of land movement in the South West (where land levels are generally getting lower through time) is likely to enhance the effect of rising sea levels.[96]

The following future scenario has been used in the Tamar Catchment Flood Management Plan: A 20% increase in peak flow in all watercourses due to climate change; a total sea level rise of 900mm by 2100 due to climate change; 7% increase in river flows due to land use change; a 4% increase in river flows in certain locations due to urban development.

Plymouth is expected to see the greatest flood risk in the future, with the number of properties at risk of flooding rising from just over 1600 to around 2,800 by 2100.[97]

The Tamar Catchment Flood Management Plan identifies that further action is necessary to reduce flood risk in Plymouth. The objectives for achieving this include:

- Assessing detailed flood risks in Plymouth and developing management plans to help reduce them;
- ensuring development conforms to PPS25 and identifying opportunities through its' implementation;
- working with developers to reduce flood risk elsewhere in Plymouth area; investigating adaptation measures for the mainline railway and the A374 road against increased flooding due to climate change;
- investigating opportunities to create green corridors alongside the rivers;
- investigating opportunities for managed realignment to restore intertidal habitat along Plymouth waterfront and estuaries; and
- reviewing urban drainage capacity within Plymouth and other affected areas.[98]

Fife

Sea level change central projection between 1990 and 2080 medium emissions scenario: 24.2cm.[99]

There is likely to be a general trend of increasing coastal water quality due the requirements of the Water Framework Directive. However, shipping, particularly in the inner Forth Estuary will continue to pose a

[96] South West Observatory, State of the South West 2010 http://www.swo.org.uk/sotsw2010-online/
[97] Tamar catchment flood management plan: http://publications.environment-agency.gov.uk/pdf/GESW1109BOUP-e-e.pdf
[98] Tamar catchment flood management plan: http://publications.environment-agency.gov.uk/pdf/GESW1109BOUP-e-e.pdf
[99] Defra, UKCP09, http://ukcp09.defra.gov.uk/content/view/20/6

risk of point source pollution.[100] Concerns have also been raised about an increase in flood risk with development in the east and north of the area potentially affecting the River Eden catchment.[101]

Climate change is likely to result in a trend of increasing flood risk throughout Fife. This trend is likely to be exacerbated by development on flood planes and low lying coastal regions.[100]

Within the Rosyth area the still-water tide levels based on the approximate peak for 1 in 200 year and 1 in 1000 years are 4.52mAOD and 4.64mAOD, respectively. This extreme tide level is based upon the POL112 method (Proudman Oceanographic Laboratory, Internal Document 112), but it does not take storm surge or wave action into consideration.[102]

UKCP09 (U.K. Climate Projections 2009) projects the sea level rise relative to the 1990 sea level height, to be 10.5 – 18 cm by 2050, and 23.4 – 39.2 cm by 2095, depending on the emissions scenario modelled.[103]

The Fife Structure Plan 2006-2026 includes targets to:

- limit water pollution to levels that do not damage natural systems;
- maintain water abstraction, run-off and recharge within carrying capacity (including future capacity) maintain and restore key ecological processes (e.g. hydrology, water quality, coastal processes);
- protect and, where necessary, enhance waterbody status; and
- reduce/manage flood risk.[104]

9.6 Assessment objective, guide questions and significance

The objective and guide questions related to water quality and resources that have been used in the assessment of the effects of the SDP are set out in Table 9.1, together with reasons for their selection.

Table 9.1 Approach to assessing the effects of SDP on Coastal change and Flood Risk

[100] Fife Council, Fife Structure Plan SEA 2008, http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/dev-plan/FifeSP/FifeSEAreport
[101] Fife Council, Fife Structure Plan 2006 - 2026 Post Adoption SEA 2010, http://www.fifedirect.org.uk/uploadfiles/publications/c64_PostAdoption-FinalisedPostAdoptionSEAStatement-January20101.pdf
[102] SEPA (from consultation)
[103] UKCP09 Maps and Key Findings http://ukclimateprojections.defra.gov.uk/content/view/972/499/
[104] Fife Council, Fife Structure Plan 2006 - 2026 Post Adoption SEA 2010, http://www.fifedirect.org.uk/uploadfiles/publications/c64_PostAdoption-FinalisedPostAdoptionSEAStatement-January20101.pdf

Objective/guide question	Reasoning
Objective: Minimise the risks from coastal change and flooding to people, property and communities.	The SEA Directive requires that likely significant effects on water be taken into account in the Environmental Report.
Will the SDP Proposals affect existing flood risks?	As with all major construction projects there is a potential to contribute to flood risk. Consideration of location is important as inappropriate siting of a development (e.g. – on a floodplain) may result in flooding of the development and other developed areas if it displaces flooding.
Will the SDP Proposals be at risk of flooding from any source?	Inappropriate siting of a development (e.g. – on a floodplain) may result in flooding of the development. Frequency and severity of flooding (pluvial, fluvial and coastal) is likely to increase with climate change.
Will the SDP Proposals affect coastal processes and/or erosion rates?	Changes to coastal processes or erosion rate caused by development have a potential to negatively impact on the marine environment. The Marine Strategy Framework Directive (2008) require member states to achieve or maintain good environmental status in the marine environment by 2020.
Will the SDP Proposals be affected by coastal processes and/or erosion?	Climate change is likely to exacerbate erosion and coastal flooding as a result of sea level rise together with the potential increase in the intensity, severity and frequency of coastal storms over the next 100 years.

Table 9.2 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the coastal change and flood risk objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 9.2 Approach to determining the significance of effects on coastal change and flood risk

Effect	Description	Illustrative Guidance
++	Significant positive	• Option is unlikely to be affected by any projected climate change and is likely to effectively remove existing flooding problems and/or adverse coastal changes elsewhere.
+	Positive	• Option is unlikely to be affected by any projected climate change and is likely to decrease risks of flood or adverse effects from coastal changes elsewhere.
0	No (neutral effects)	• Option is unlikely to be affected by any projected climate change and is unlikely to affect flood risk or coastal changes elsewhere.
-	Negative	• Option site is at risk of flooding (less than 1 in 75 years), storm damage or erosion, however these risks can be effectively managed without high cost. • Option could adversely affect flood risks and/or negatively affect other sites through coastal changes (such as storm damage/erosion).
--	Significant negative	• Site of option is at a significant risk of flooding (1 in 75 years or greater), storm damage or erosion, risk can only be avoided at very high costs. Mitigated option is likely to cause significant worsening of flood risks and damage offsite in coastal locations (such as erosion, instability or changes in sedimentation).

Effect	Description	Illustrative Guidance
?	Uncertain	• From the level of information available the impact that the option would have on this objective is uncertain.

9.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the coastal change and flood risk objective. Table 9.3 provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 9.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 9.4** below.

Table 9.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than 'greenfield' sites, although it is recognised that 'brownfield' land can be important for

Category	Assumption Description
	conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m$^{2.}$ Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2 . As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average). • It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine

Category	Assumption Description
	• It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since breaking a cleared submarine is little different to breaking a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be transported from the initial dismantling facility to the interim storage facility by sea, rail or

Category	Assumption Description
	road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Stage I: Designing and Developing the Initial Submarine Dismantling Facilities

Coastal Change and Flood Risk

Option 1: Develop a Greenfield Site for Submarine Dismantling

Assessment of Effects:

Due to the need for the site to be in a coastal location, the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Depending on the exact location of the facilities and ancillary development/infrastructure, there is potential that development could result in increased flood risk as a result of surface water runoff related to the replacement of greenfield land with buildings and hardstanding associated with dockside development.

Surface construction activities, particularly site clearance and levelling, the introduction of hardstanding, and the construction of surface bunds from the excavated topsoil may also increase flood risk during the construction phase, due to changes to surface drainage patterns and the increase in impermeable surface areas, affecting run-off rates and flow pathways. Unless mitigated, the changes in flows and the infrequent increased sediment deposition associated with flooding may affect aquatic environments.

Given coastal location requirements, there is also potential for development to affect existing flood and/or coastal defences. However, it is assumed that Flood Risk Assessments will inform site selection and any development would incorporate measures to alleviate flood risk (e.g. SUDS) such that the potential effect is reduced.

Development of a coastal greenfield site has the potential to impact on coastal processes. The construction of infrastructure, for example berthing facilities and supporting activities such as dredging, could alter coastal geomorphology and affect erosion/sediment deposition rates. This could have a consequential affect on neighbouring coastal areas through changes to coastal processes. These changes could also affect the resilience of neighbouring areas to flooding, which would be a particular issue if it increases flood risk for local communities or important bird feeding areas.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities and infrastructure (e.g. roads, car parking, security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale of construction would be reduced under RC/RPV storage options in the short term, there may be a reduction in flood risk arising from the development as the area of greenfield land to be replaced with buildings and hardstanding would be reduced thereby reducing the potential for surface water runoff relative to Packaged Waste storage option (which would require construction of all dismantling and size reduction facilities ‘up front’). However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities and a delay in construction (by approximately 25 years) may mean that the potential effects of climate change (coastal inundation and the increased frequency of more intensive weather events) are more likely to affect activities.

Proposed Mitigation / Enhancements Measures:

- A Flood Risk Assessment (FRA) should be carried out which assesses all potential sources of flood risk and identifies any mitigation measures necessary to ensure flood risk at the site or down catchment is not increased during construction (or subsequently). The FRA should include a surface drainage strategy, detailing how run-off from rainfall would be discharged from the site at rates no higher than those from the pre-existing site, and preferably at lower rates, up to the 50 year rainfall event, allowing for climate change. The FRA would need to meet the requirements of PPS 25: Development and Flood Risk (England), TAN 15 (Wales) or other equivalent policy depending on the location of the greenfield dismantling facility.

Stage I: Designing and Developing the Initial Submarine Dismantling Facilities

Coastal Change and Flood Risk

- Consideration to be given to Shoreline Management Plans and ICZMs as part of any development proposal.
- Where possible, infrastructure should be located to minimise any effect on hydrology as far as possible. Surface mapping can inform the identification of areas that may be most at risk and allow a concentrated focus on prevention.
- Design for surface water drainage should incorporate sustainable drainage techniques (SUDS) where possible which include surface storage and attenuation, and infiltration to ground if near surface hydrogeology is suitable. Assuming the site(s) is greenfield, run-off from rainfall should be limited to greenfield rates. In line with the requirements of Planning Policy Statement 25 and other equivalent bodies, SUDS should be used to attenuate any increases in surface run-off rates.

Summary: Option 1 has been assessed as having a significant negative effect on this objective. This is due to the scale of development required, the replacement of a greenfield site with buildings and hardstanding associated with dockside development that could increase surface water run-off rates and the construction activities themselves. Given the requirements for a coastal location there is also potential for the development to affect existing coastal defences in adjacent locations through adjustments to tidal flow and changes to erosion rates. Development of a coastal greenfield site has the potential to impact on coastal processes which could affect resilience to flooding. For RC and RPV storage options construction of the size reduction facility would be delayed which may reduce flood risk arising from the development in the short term. However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities and a delay in construction may mean that the potential effects of climate change are more likely to affect activities.	--

Option 2: Develop Brownfield Site for Submarine Dismantling

Assessment of Effects:

Due to the need for the site to be in a coastal location, the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions.

Depending on the exact location of the dismantling and size reduction facilities and ancillary development, there is potential that development could result in increased flood risk as a result of increased surface water runoff from the construction of buildings and hardstanding associated with dockside development although within this option it is considered that through previous uses the site is expected to have retained many of these facilities.

Surface construction activities, particularly site clearance and levelling, the introduction of hardstanding, and the construction of surface bunds from the excavated topsoil may also increase flood risk during the construction phase, however it is expected that changes to surface drainage patterns and the increase in impermeable surface areas will be limited due to previous activities having taken place on the site also requiring similar hardstandings and impermeable surface areas.

Given coastal location requirements, there is also potential for development to affect existing flood and/or coastal defences. However, it is assumed that Flood Risk Assessments will inform site selection and any development would incorporate measures to alleviate flood risk (e.g. SUDS) such that the potential effect is reduced.

Development of a coastal brownfield site has the potential to impact on coastal processes although this is expected to be less than that identified under Option 1 due to the previous uses of the brownfield site being of a similar nature. The renovation, construction or redevelopment of existing infrastructure, for example berthing facilities and supporting activities such as dredging, could alter coastal geomorphology and affect erosion/sediment deposition rates although significantly less than identified within Option 1.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total

Stage I: Designing and Developing the Initial Submarine Dismantling Facilities Coastal Change and Flood Risk	
footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on a brownfield site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities (e.g. security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage. As the scale of construction would be reduced under RC/RPV storage options in the short term, there may be a reduction in flood risk relative to the Packaged Waste storage option (which would require construction of all dismantling and size reduction facilities 'up front') although this is not expected to be significant given the brownfield status of the site. However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities and a delay in construction (by approximately 25 years) may mean that the potential effects of climate change (coastal inundation and the increased frequency of more intensive weather events) are more likely to affect activities. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a neutral effect on this objective. This is due to the fact that it is considered that with the limited scale of development required of a brownfield site, there is less potential for increased flood risk as it is expected that the majority of infrastructure will already be in place such as hardstandings and docking facilities. Given the requirements of dismantling and size reduction facilities there is likely to be a need for site reconfiguration which could increase the potential for flood risk although the perceived risk is not considered to be high and is unlikely to be substantially different from the current situation. Further to this there is also potential for the development to affect coastal processes, if dredging is a significant requirement of the construction and operation of the new facilities. For RC and RPV storage options construction of the size reduction facility would be delayed which may reduce flood risk arising from the development in the short term. However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities and a delay in construction may mean that the potential effects of climate change are more likely to affect activities.	**0**
Option 3: Develop Licensed/Authorised Site for Submarine Dismantling	
Assessment of Effects: Due to the need for the site to be in a coastal location, the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Depending on the exact location of the dismantling/size reduction facilities and ancillary development/infrastructure, there is potential that development could result in increased flood risk as a result of increased surface water runoff from the construction of buildings and hardstanding associated with dockside development although within this option it is considered that through previous uses the site is expected to have retained many of these facilities. Surface construction activities, particularly site clearance and levelling, the introduction of hardstanding, and the construction of surface bunds from the excavated topsoil may also increase flood risk during the construction phase, however it is expected that changes to surface drainage patterns and the increase in impermeable surface areas will be limited due to existing activities taking place on the site also requiring similar hardstandings and impermeable surface areas. Given coastal location requirements, there is also potential for development to affect existing flood and/or coastal defences. However, it is assumed that Flood Risk Assessments will have already informed site selection as a licensed authorised site and any existing development would have incorporated measures to alleviate flood risk (e.g. SUDS) such that the potential effect is reduced.	

Stage I: Designing and Developing the Initial Submarine Dismantling Facilities Coastal Change and Flood Risk	
Development of an existing coastal licensed authorised site has the potential to impact on coastal processes although this is expected to be less than that identified under Option 1 due to the existing uses of the site being of a similar nature to that of the proposed development. The renovation, construction or redevelopment of existing infrastructure, for example berthing facilities and supporting activities such as dredging, could alter coastal processes and affect erosion/sediment deposition rates although significantly less than identified within Option 1. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on an existing Licensed/Authorised site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities. A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage. As the scale of construction would be reduced under RC/RPV storage options in the short term, there may be a reduction in flood risk relative to the Packaged Waste storage option (which would require construction of all dismantling and size reduction facilities 'up front') although this is not expected to be significant. However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities and a delay in construction (by approximately 25 years) may mean that the potential effects of climate change (coastal inundation and the increased frequency of more intensive weather events) are more likely to affect activities. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a neutral effect in relation to this objective. This is due to the fact that it is considered that with the limited scale of development required an existing Licensed/Authorised site there is a less potential for increased floodrisk as it is expected that the majority of infrastructure will already be in place such as hardstandings and docking facilities. Given the requirements of dismantling and size reduction facilities there is likely to be a need for minor site reconfiguration which could increase the potential for flood risk although the perceived risk is not considered to be high and is unlikely to be substantially different from the current situation. Further to this there is also potential for the development to affect existing coastal processes, if dredging is a significant requirement of the construction and operation of the new facility. For RC and RPV storage options construction of the size reduction facility would be delayed which may reduce flood risk arising from the development in the short term. However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities and a delay in construction may mean that the potential effects of climate change are more likely to affect activities.	**0**

Stage II: Designing and Developing the Interim ILW Storage Facilities

Coastal Change and Flood Risk

Option 1: Develop Greenfield Site for ILW Storage

Assessment of Effects:

Given the generic nature of the construction proposals for the interim storage facility, it is assumed that the potential effects associated with this objective will be largely similar as for Stage 1 (construction of dismantling and size reduction facilities).

The construction of the SDP storage facilities and ancillary infrastructure on a greenfield site could result in significant effects on coastal change and flood risk.

As there is potential for the site to be in a coastal location, it will be important to determine whether the site may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Any choice of coastal location for the SDP storage facilities must therefore consider the identified sea level changes and the increased frequency of extreme weather conditions. Climate change effects such as intensified weather events have the potential to affect the development of the storage facility. Such effects may result in damage to facilities or disruption of construction activity.

Depending on the exact location of the storage facility and ancillary development/infrastructure, there is potential that development could result in increased flood risk as a result of changes to surface water runoff related to the replacement of greenfield land with buildings and hardstanding. Specific construction activities that could affect drainage and localised flooding include site clearance and levelling, the introduction of temporary hardstanding, and the construction of surface bunds from the excavated topsoil. Unless mitigated, the changes in flows and the infrequent increased sediment deposition associated with flooding may affect aquatic environments.

Given possible coastal location requirements, there is also potential for development to affect existing flood and/or coastal defences. However, it is assumed that Flood Risk Assessments will inform site selection and any development would incorporate measures to alleviate flood risk (e.g. SUDS) such that the potential effect is reduced.

Development of a coastal greenfield site has the potential to impact on coastal processes. The construction of infrastructure, for example berthing facilities (dependant on the technical option requirements) and supporting activities such as dredging, could alter coastal geomorphology and affect erosion/sediment deposition rates. This could have a consequential affect on neighbouring coastal areas through changes to coastal processes. These changes could also affect the resilience of neighbouring areas to flooding.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area, as well reception, admin, dispatching, inspection and maintenance areas. Additional infrastructure will also be required under this land use option such as docking facilities, security (standoff and centre), car parking, roads and internal rail line although the total area required for these additional features is unknown.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities, car parking and roads will also be required under this land use option. Should RPVs be transported by sea (which is the most likely option) then docking facilities would also be required.
- Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Additional infrastructure including security (standoff and centre), car parking, roads and an external rail line (if required), may also be required under this land use option. As packaged waste is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.

The scale and potential significance of effects associated with construction is most likely to be greatest for the development a RC storage facility given the increased footprint and land-take of greenfield land relative to RPV and Packaged Waste storage options causing more likelihood of flooding through surface water run off from ground levelling, hardstandings and building construction.

Furthermore, due to the need to transport RCs by sea, RC storage facilities would require the construction of a dock and dredging activities which could have a potentially significant negative effect on coastal change and flood risk through alterations to coastal geomorphology and affect erosion/sediment deposition rates. Similar effects may also be generated under the RPV storage option should RPVs be transported by

Stage II: Designing and Developing the Interim ILW Storage Facilities **Coastal Change and Flood Risk**	
sea (which is the most likely mode of transport to be utilised). **Proposed Mitigation / Enhancements Measures:** Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities on a greenfield site).	
Summary: Option 1 has been assessed as having a significant negative effect on this objective due to the potential for substantial changes in surface water runoff and drainage arising from the replacement of a greenfield site with high infiltration rates with impermeable surfaces. The magnitude of this change will be greatest for the development of a RC storage facility due to the large footprint associated with this technical option. Development of a coastal greenfield site has the potential to impact on coastal processes. The construction of berthing facilities and the supporting activities such as dredging (for RC and RPV storage options), could alter coastal geomorphology and affect erosion/sediment deposition rates. This could have a consequential affect on neighbouring coastal areas through changes to coastal processes.	--
Option 2: Develop a Brownfield Site for ILW Storage	
Assessment of Effects: The construction of the SDP storage facilities and ancillary infrastructure on a brownfield site would result in a range of effects similar to those described in Option 1, namely the changes in surface runoff and flooding, the changes to sea defences and the potential to affect coastal processes. Under Option 2, previously developed land would be utilised and it is assumed that there would be a majority of required ancillary infrastructure in place (such as docks, railheads or roads) in place which would reduce the scale of construction required. It is assumed that in using a previously developed site, the majority of infrastructure will already be in place, which will include the presence of hardstanding and docking facilities (if required at a coastal location). Any consequential changes to surface runoff from the new construction activities would then be minimal. The potential for any change in flood risk is not considered to be high or substantially different from the current situation. As it is assumed that berthing or docking facilities are already present, it is considered unlikely that Option 2 would have any effects on coastal defences or coastal processes. However, if dredging were required to maintain a navigable channel to the facility, there may be some effects on coastal processes and local coastal erosion rates. **Technical Options:** • RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area, as well as reception, admin, dispatching, inspection and maintenance areas. Security facilities including a security centre and standoff area will also be required, as well as an internal rail line. However, it is assumed that docking facilities, car parking and roads will already be present. • RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and docking facilities (should RPVs be transported by sea) will already be present. • Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and external rail line (if required) will already be present. As PW is likely to be transported by either road or rail, it is assumed that there will be no need for a docking facility. The scale and potential significance of effects associated with construction is most likely to be greatest for the development a RC storage facility given the increased footprint relative to RPV and Packaged Waste storage options causing more likelihood of flooding through surface water run	

Stage II: Designing and Developing the Interim ILW Storage Facilities

Coastal Change and Flood Risk

off from ground levelling, hardstandings and building construction.

Furthermore, due to the need to transport RCs by sea, the RC storage option may require dredging which could have a potentially significant negative effect on coastal change and flood risk through alterations to coastal geomorphology and affect erosion/sediment deposition rates. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised).

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).

Summary: Option 2 has been assessed as having a neutral effect on this objective. This is due to the fact that it is considered that with the limited scale of development required of a brownfield site there is less potential to affect surface runoff or to increase flood risk. It is assumed that in using a previously developed site, the majority of infrastructure will already be in place, which will include the presence of hardstanding and docking facilities (if required at a coastal location) and any consequential changes to surface runoff from the new construction activities will be minimal. The scale and potential significance of effects associated with development of a storage site are likely to be greatest for the RC storage option given the increased footprint and land-take of brownfield land relative to RPV and Packaged Waste storage options, causing more likelihood of flooding through surface water run off from ground levelling, hardstandings and building construction. There is also the potential for the development to affect coastal processes, if dredging is a requirement of the construction and operation of the new storage facility (as under RC and RPV storage options); however, it is not envisaged that this would be significant.	**0**

Option 3: Develop a Licensed/Authorised Site for ILW Storage

Assessment of Effects:

The construction of the SDP storage facilities and ancillary infrastructure on an existing Licensed/Authorised site would result in a range of effects similar to those described in Options 1 and 2, namely the changes in surface runoff and flooding, the changes to sea defences and the potential to affect coastal processes.

Under Option 3, the use of an existing Licensed/Authorised site is assumed to provide the majority of required ancillary infrastructure required which would reduce the scale of construction needed. The reduction on construction activity will also reduce the likelihood of disruption to surface water drainage.

It is also that the site will be largely developed, with the majority of surfaces impermeable or covered with existing structures. Any consequential changes to surface runoff from the new construction activities would then be minimal. The potential for any change in flood risk is not considered to be high or substantially different from the current situation.

As it is assumed that berthing or docking facilities are already present, it is considered unlikely that Option 3 would have any effects on coastal defences or coastal processes. However, if dredging were required to maintain a navigable channel to the facility, there maybe some effects on coastal processes and local coastal erosion rates.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well reception, admin, dispatching, inspection and maintenance areas. It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present.
- RPV storage will require a facility with an area in the region of 801m^2 (including total vault area and reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as docking facilities, security

Stage II: Designing and Developing the Interim ILW Storage Facilities Coastal Change and Flood Risk	
(standoff and centre), car parking, roads and internal rail line are assumed to be already present. • Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including total vault area as well as reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as security (standoff and centre), car parking, roads and external rail line (if required) are assumed to be already present. As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).	
Summary: Option 3 has been assessed as having a neutral effect in relation to this objective. This is due to the fact that it is considered that with the limited scale of development required within an existing Licensed/Authorised site there is a less potential there is less potential to affect surface runoff or to increase flood risk. It is assumed in using an existing Licensed/Authorised site that the majority of infrastructure will already be in place, including the presence of hardstanding and any consequential changes to surface runoff from the new construction activities will be minimal. The scale and potential significance of effects associated with development of a storage site are likely to be greatest for the RC storage option given the increased footprint and land-take of brownfield land relative to RPV and Packaged Waste storage, causing more likelihood of flooding through surface water run off from ground levelling, hardstandings and building construction. There is also the potential for the development to affect coastal processes, if dredging is a requirement of the construction and operation of the new storage facility (as under RC and RPV storage options); however, it is not envisaged that this would be significant.	**0**

Stage III: Docking the Submarines and Processing the Reactor Compartments Coastal Change and Flood Risk	
Option 1: Dock Submarine & Cut-Out Reactor Compartment	
Assessment of Effects: Due to the need for the dismantling facility to be in a coastal location, the site may be affected by flooding, coastal inundation or sea level rise related to climate change or extreme weather conditions, this may be in the form of damage to facilities/infrastructure, disrupting activity or the potential mobilisation of hazardous materials generated or used during operation. The location of the facility will influence the likelihood of impact from changes to the climate, for example, impacts are expected to be more felt in the southern and eastern parts of the UK due to compounding effects of post-glacial rebalancing. Although it is considered that the location of the dismantling facility will have been chosen to avoid these predicted effects and that the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact. Depending on submarine transport methods (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used) there is the potential for impacts on coastal processes and flood risk from any dredging or channel modifications Submarine docking operations involve flooding the DBV to dock the submarine and subsequently dewatering the dock. This process would involve the transfer of significant volumes of water into the dock from the basin, and subsequently back into the basin. However, as the water levels within the basin are controlled, and the docking of the submarines would be expected to be a routine procedure, these operations are not anticipated to affect existing flood risk. For Option 1 it is assumed that all potential sources of radiation are securely contained within the RC (prior to separation from the rest of the submarine) and once seperated, will be plated which will minimise the risk of any hazardous materials becoming mobilised in such an event. It is considered that the operation of the dismantling facility is unlikely to affect flood risk. Although it is expected that there will be discharges from the facility during operation it is considered that they will be of a scale unlikely to affect rate of flows of receiving waters. **Proposed Mitigation / Enhancements Measures:** None identified	
Summary: Option 1 has been assessed as having a neutral effect on this objective as the processing and dismantling activities are unlikely to alter the risks of coastal change or flooding. Any discharges from the facility are considered to be of a scale too small to change flow rates of receiving waters. Due to the need for a coastal location, there is potential that the facility could be negatively affected by coastal inundation, flooding or sea level rise as a result of climate change, in terms of facility damage, activity disruption or potential mobilisation of hazardous wastes. However, it is considered that locations will have been chosen to avoid such affects and that flood defence measures will be incorporated into the site design so that risk would be considered low.	**0**
Option 2: Dock Submarine & Cut-Out Reactor Pressure Vessel	
Assessment of Effects: The scope of potential effects (and uncertainties) on coastal change or flooding from submarine movements are similar to those outlined for Option 1. The risk of the dismantling facility being affected by extreme weather conditions or climate change resulting in coastal inundation, flooding or sea level rise is the same across all options, depending on the location of the site, and is considered to be low. Whilst it is considered that the location of the dismantling facility will have been chosen to avoid these predicted effects and that the appropriate flood defence measures will be	

Stage III: Docking the Submarines and Processing the Reactor Compartments Coastal Change and Flood Risk	
incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact. In the case of such an event occurring, there could potentially be a greater volume of hazardous material within the site under Option 2 relative to Option 1 as RPV cut out will generate some LLW, which could enter into the marine environment, increasing potential risks. As discussed in Option 1 it is considered that operations during dismantling and processing is very unlikely to alter the risks of coastal change or flood risk. **Proposed Mitigation / Enhancements Measures:** None identified	
Summary: Option 2 has been assessed as having a neutral effect on this objective as the processing and dismantling activities are unlikely to alter the risks of coastal change or flooding. Any discharges from the site are considered to be of a scale too small to change flow rates of receiving waters. Due to the need for a coastal location, there is potential that the site could be negatively affected by coastal inundation, flooding or sea level rise as a result of climate change, in terms of facility damage, activity disruption or potential mobilisation of hazardous wastes. However, it is considered that locations will have been chosen to avoid such events and that flood defence measures will be incorporated into the site design so that risk would be considered low.	**0**
Option 3: Dock Submarine & Cut-up Packaged Waste	
Assessment of Effects: The scope of potential effects (and uncertainties) on coastal change or flooding from submarine movements are similar to those outlined for Option 1. The risk of the dismantling facility being affected by extreme weather conditions or climate change resulting in coastal inundation, flooding or sea level rise is the same across all options, depending on the location of the facility, and is considered to be low. Whilst it is considered that the location of the dismantling facility will have been chosen to avoid these predicted effects and that the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact. In the case of such an event occurring, there could potentially be a greater volume of hazardous material within the site under Option 3, as full processing to packaged waste will generate volumes of LLW and ILW. However, as it is assumed that all radioactive material would be held safely in a sealed and water tight environment, including ILW which will be secured as packaged waste, the likelihood of such an event is considered very remote. As discussed in option 1 it is considered that operations during dismantling and processing is very unlikely to alter the risks of coastal change or flood risk. **Proposed Mitigation / Enhancements Measures:** None identified	
Summary: Option 3 has been assessed as having a neutral effect on this objective as the processing and dismantling activities are unlikely to alter the risks of coastal change or flooding. Any discharges from the site are considered to be of a scale too small to change flow rates of receiving waters. Due to the need for a coastal location, there is potential that the facility could be negatively affected by coastal inundation, flooding or sea level rise as a result of climate change, in terms of facility damage, activity disruption or potential mobilisation of	**0**

Stage III: Docking the Submarines and Processing the Reactor Compartments Coastal Change and Flood Risk	
hazardous wastes. However, it is considered that locations will have been chosen to avoid such events and that flood defence measures will be incorporated into the site design so that risk would be considered low.	

Stage IV: Dismantling and Recycling the Residual Submarine Hulls and Processing Wastes Coastal Change and Flood Risk	
All Options	
Assessment of Effects: Due to the need for both the dismantling and ship-recycling sites to be in coastal locations, the sites may be affected by flooding, coastal inundation or sea level rise related to climate change or extreme weather conditions. This may be in the form of damage to facilities/infrastructure, disrupting activity or the potential mobilisation of hazardous wastes generated during operation (such as asbestos, chromate paints and cables containing PCBs). However, it is expected that any hazardous wastes will be within watertight containers as part of environmental permitting requirements to prevent against mobilisation. The location of the sites will influence the likelihood of impact from changes to the climate. For example, impacts are expected to be more felt in the southern and eastern parts of the UK due to compounding effects of post-glacial rebalancing. Although it is considered that the location of the dismantling site will have been chosen to avoid these predicted effects and that the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact. However, as it is assumed that the ship recycling site is already in use, it may have been built prior to consideration of likely climate change impact so this may not have been considered during its development. It is considered that the operation of the dismantling and ship recycling sites is unlikely to affect coastal change or flood risk. Although there will be discharges from the sites during operation it is considered that they will be of a scale similar to existing activities at the ship recycling facility and will be unlikely to affect rate of flows of receiving waters. However, if dredging was necessary to maintain the docks and depth of the channels then this could alter coastal geomorphology and affect erosion/sediment deposition rates, but this is considered to be unlikely due to the scale required (if at all). **Proposed Mitigation / Enhancements Measures:** None identified	
Summary: This stage has been assessed as having a neutral effect on this objective as the operational activities are unlikely to alter the risks of coastal change or flooding. Any discharges from the site are considered to be of a scale too small to change flow rates of receiving waters. Due to the need for a coastal location, there is potential that the site could be negatively affected by coastal inundation, flooding or sea level rise as a result of climate change, in terms of facility damage, activity disruption or potential mobilisation of hazardous wastes. However, it is considered that locations will have been chosen to avoid such affects and that flood defence measures will be incorporated into the site design so that risk would be considered low.	**0**

Stage V: Transport RC/RPV/ILW to Interim Storage Coastal Change and Flood Risk	
Option 1: Reactor Compartment Transport and Storage	
Assessment of Effects: The movement of the RC by sea barge will not result in any direct effects to flood risk and coastal change. None the less, as the location of the dismantling facility and the interim storage facility are currently unknown it is therefore assumed that there is potential for the requirement of dredging to be required to enable clear access and egress to the docking facilities required at both the dismantling facility site and the storage site under this option to maintain operation. With the risk of dredging being required for the transportation of RC, it could create a potential effect under this objective as there is potential for dredging at two sites, however this is considered unlikely. Due to the need for both the dismantling and interim storage facilities to be in coastal locations under this option, the facilities may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Climate change effects such as intensified weather events have the potential to affect the operation of the dismantling site and transportation, through damage to the facility, causing disruption/delays to activities and transportation or potential mobilisation of hazardous substances (however as part of environmental permitting requirements it is assumed that hazardous substances will be contained in watertight containers). Although, it is considered that the location of the sites will have been chosen to avoid these predicted effects and the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact. **Proposed Mitigation / Enhancements Measures:** • Site selection to have consideration of the potential for dredging and the potential effects on flood risk to site(s) • Emergency response plan to address any potential unplanned events	
Summary: It is expected that transportation of the RC to an interim storage facility will have no effect on flood risk and coastal change. The risk of potential dredging or climate change effects, such as intensified weather, negatively affecting this objective are considered to be low due to low likelihoods and the consideration of site location and appropriate flood defence measures to avoid these effects.	**0**
Option 2: Reactor Pressure Vessel Transport and Storage	
Assessment of Effects The movement of the RPV by rail or road will not result in any direct effects to flood risk and coastal change. None the less if movement of the RPV is by sea and thus utilising a sea barge, as the location of the dismantling facility and the interim storage facility are currently unknown it should be assumed that there is potential for the requirement of dredging to enable clear access and egress to the docking facilities required at both the dismantling facility site and the storage site under this option to maintain operation. With the risk of dredging being required for the transportation of RPV, it could create a potential effect under this objective as there is potential for dredging at two sites, however this is considered unlikely. Due to the need for both the dismantling and interim storage facilities to be in coastal locations under this option, the facilities may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Climate change effects such as intensified weather events have the potential to affect the operation of the dismantling site, through damage to the facility, causing disruption/delays to activities or potential mobilisation of hazardous substances (however as part of environmental permitting requirements it is assumed that hazardous substances will be contained in watertight containers). Although, it is considered that the location of the sites will have been chosen to avoid these predicted effects and the appropriate flood defence measures will be incorporated into site	

Stage V: Transport RC/RPV/ILW to Interim Storage Coastal Change and Flood Risk	
designs, given the uncertain nature of climate change there is still the potential for impact. **Proposed Mitigation / Enhancements Measures** • Emergency response plan to address any potential unplanned events	
Summary: It is expected that transportation of the RPV to interim storage will have no effect on flood risk and coastal change. The risk of potential dredging or climate change effects, such as intensified weather, negatively affecting this objective are considered to be low due to low likelihoods and the consideration of site location and appropriate flood defence measures to avoid these effects.	**0**
Option 3: Packaged Waste Transport and Storage	
Assessment of Effects: The movement of the packaged waste by rail or road will not result in any direct effects to flood risk and coastal change. If however packaged waste is transported by sea from the dismantling site to the interim storage there is potential for dredging. As the location of the dismantling facility and the interim storage facility are currently unknown it should be assumed that there is potential for the requirement of dredging to enable clear access and egress to the docking facilities required at both the dismantling facility site and the storage site under this option to maintain operation. With the risk of dredging being required for the transportation of packaged waste, it could create a potential effect under this objective as there is potential for dredging at two sites, however this is considered to be unlikely. Due to the need for the dismantling facility to be in a coastal location under this option, it may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions. Current information indicates that the UK is experiencing sea level rise of approximately 1mm per annum and a global sea level rise of approximately 3mm per annum. Climate change effects such as intensified weather events have the potential to affect the operation of the dismantling site, through damage to the facility, causing disruption/delays to activities or potential mobilisation of hazardous substances (however as part of environmental permitting requirements it is assumed that hazardous substances will be contained in watertight containers). Although, it is considered that the location of the sites will have been chosen to avoid these predicted effects and the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact. **Proposed Mitigation / Enhancements Measures** • Emergency response plan to address any potential unplanned events	
Summary: It is expected that transportation of the packaged waste to Interim storage will have no effect on flood risk and coastal change. The risk of potential dredging or climate change effects, such as intensified weather, negatively affecting this objective are considered to be low, due to low likelihoods and the consideration of site location and appropriate flood defence measures to avoid these effects.	**0**

Stage VI: : Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF

Coastal Change and Flood Risk

Option 1: Reactor Compartment Segregation and Size Reduction, PW Transfer to Proposed GDF

Assessment of Effects:

Depending on the location of the dismantling facility for removal of the RPV from the RC, and the size reduction facility for the packaging of ILW vis-à-vis the interim storage facility, there may be a requirement to transport RC's prior to processing, it is expected due to the size and weight of RC that this will only occur by sea and by barge.

None the less, as the location of the dismantling facility and the interim storage facility are currently unknown it is therefore assumed that there is potential for the requirement of dredging to be required to enable clear access and egress to the docking facilities required at both the dismantling facility site and the storage site under this option to maintain operation. With the risk of dredging being required for the transportation of RC, it could create a potential effect under this objective as there is potential for dredging at two sites.

Due to the need for the site to be in a coastal location, the site may be affected by flooding, coastal inundation or sea level rise related to climate change or extreme weather conditions, this may be in the form of damage to facilities/infrastructure, disrupting activity or the potential mobilisation of hazardous materials generated or used during operation.

The location of the site will influence the likelihood of impact from changes to the climate, for example, impacts are expected to be more felt in the southern and eastern parts of the UK due to compounding effects of post-glacial rebalancing. Although it is considered that the location of the segregation and storage site will have been chosen to avoid these predicted effects and that the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact.

In the case of such an event occurring, there could potentially be a greater volume of hazardous material within the site under Option 1 relative to Option 2 or 3, increasing potential risks.

It is considered that the operations of the interim storage facility or the segregation and size reduction facility are unlikely to affect flood risk. Although it is expected that there will be discharges from the segregation and size reduction facility during operation however it is considered that they will be of a scale unlikely to affect rate of flows of receiving waters.

Proposed Mitigation / Enhancements Measures:

- Site selection to have consideration of the potential for dredging and the potential effects on flood risk to site(s)
- Emergency response plan to address any potential unplanned events.

Summary: Option 1 has been assessed as having a neutral effect on this objective as the segregation and size reduction activities are unlikely to alter the risks of coastal change or flooding. Any discharges from the site are considered to be of a scale too small to change flow rates of receiving waters. Due to the need for a coastal location, there is potential that the site could be negatively affected by coastal inundation, flooding or sea level rise as a result of climate change, in terms of facility damage, activity disruption or potential mobilisation of hazardous wastes. However, it is considered that locations will have been chosen to avoid such affects and that flood defence measures will be incorporated into the site design so that risk would be considered low.	**0**

Stage VI: : Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF

Coastal Change and Flood Risk

Option 2: Reactor Pressure Vessel Segregation and Size Reduction, PW Transfer to Proposed GDF

Assessment of Effects:

The risk of the segregation and size reduction site being affected by extreme weather conditions or climate change resulting in coastal inundation, flooding or sea level rise is only a consideration for this option if a site is situated within a coastal location. Under this option RPV is not necessarily required to have a coastal location due to the potential for transportation of RPV to be multimodal (sea, rail or road) and therefore the risk is considered to be low. Further, it is considered that the location of the segregation and size reduction site will have been chosen, whether coastal or not, to avoid these predicted effects and that the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact.

In the case of such an event occurring, there could potentially be a reduced volume of hazardous material within the site under Option 2 relative to Option 1 as RPV segregation and size reduction will generate some radioactive and non radioactive waste streams (such as asbestos or PCBs), which could enter into the marine environment, increasing potential risks.

As discussed in Option 1 it is considered that operations during segregation and size reduction is very unlikely to alter the risks of coastal change or flood risk.

Proposed Mitigation / Enhancements Measures:

None identified

Summary: Option 2 has been assessed as having a neutral effect on this objective as the processing and dismantling activities are unlikely to alter the risks of coastal change or flooding. Any discharges from the site are considered to be of a scale too small to change flow rates of receiving waters. Under this option RPV is not necessarily required to have a coastal location due to the potential for transportation of RPV to be multimodal (sea, rail or road and therefore the risk is considered to be low. Further, it is considered that the location of the segregation and size reduction site will have been chosen, whether coastal or not, to avoid these predicted effects and that the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact.	**0**

Option 3: Transport Packaged Waste to Proposed GDF

Assessment of Effects:

The risk of the segregation and size reduction site being affected by extreme weather conditions or climate change resulting in coastal inundation, flooding or sea level rise is only a consideration for this option if a site is situated within a coastal location. Under this option packaged waste is not necessarily required to have a coastal location due to the potential for transportation of packaged waste to be multimodal (sea, rail or road and therefore the risk is considered to be low. Further, it is considered that the location of the segregation and size reduction site will have been chosen, whether coastal or not, to avoid these predicted effects and that the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact.

In the case of such an event occurring, there could potentially be some radioactive and non radioactive waste streams which could enter into the marine environment, increasing potential risks. However, as it is assumed that all radioactive material would be held safely in a sealed and water tight package, the likelihood of such an event is considered very remote.

As discussed in Option 1 it is considered that operations during dismantling and processing is very unlikely to alter the risks of coastal change or flood risk.

Stage VI: : Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Coastal Change and Flood Risk	
Proposed Mitigation / Enhancements Measures: None identified	
Summary: Option 3 has been assessed as having a neutral effect on this objective as the processing and dismantling activities are unlikely to alter the risks of coastal change or flooding. Any discharges from the site are considered to be of a scale too small to change flow rates of receiving waters. Under this option it is not necessarily required to have a coastal location due to the potential for transportation of packaged waste to be multimodal (sea, rail or road and therefore the risk is considered to be low. Further, it is considered that the location of the segregation and size reduction site will have been chosen, whether coastal or not, to avoid these predicted effects and that the appropriate flood defence measures will be incorporated into site designs, given the uncertain nature of climate change there is still the potential for impact.	**0**

Stage VII: Decommissioning the SDP Facilities Coastal Change and Flood Risk	
Option 1: Decommission Greenfield Sites	
Assessment of Effects: It is generally assumed that decommissioning of SDP facilities constructed on greenfield land may reduce the potential risk of flooding by returning sites to the previous state of land characterisation with the potential benefits of retaining coastal defences developed during the construction of the facilities. In order to restore the land to its original greenfield state, all hardstanding will need to be removed increasing the levels of land excavation required. Surface decommissioning activities, particularly site clearance and levelling and the removal of hardstanding may also reduce the risk of surface flooding during the decommissioning phase, due to changes to surface drainage patterns and a reduction in impermeable surface areas. There is potential for demolition of site infrastructure to affect existing flood and/or coastal defences. However, it is assumed that any flood alleviation or protection measures developed during the construction of the facilities would be left in situ thus maintaining the sites' current levels of protection against flood risk. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. Due to the need to transport RCs by sea, a RC storage facility would be coastally located and activities may be affected by coastal inundation or sea level rise related to climate change or extreme weather conditions and retention of coastal defences may be required. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised). **Proposed Mitigation / Enhancements Measures:** None identified.	
Summary: Option 1 has been assessed as having a neutral effect on this objective. Although there is the potential for reduced floodrisk and surface runoff given that impermeable infrastucture such as such as hardstandings and docking facilities will be removed this is not considered to be significant. There is the potential that any flood alleviation or flood protection measures developed during the construction of the facilities would be left in situ, thus maintaining the sites' current levels of protection against flood risk.	**0**
Option 2: Decommission Brownfield Sites	
Assessment of Effects: It is generally assumed that decommissioning of SDP facilities constructed on brownfield land will reduce the potential risk of flooding through a return of sites to the previous state of land characterisation. Depending on the exact location of the facilities, demolition could result in decreased flood risk as a result of reduced surface water runoff from a reduction in hardstanding and impermeable surfaces at site. However, due to the assumed reduced levels of demolition required and a range of existing infrastructure being left 'in situ', the scale of these potential effects is considered to be less. As with Option 1, there is the potential that any flood alleviation or flood protection measures developed during the construction of the facilities would be left in situ thus maintaining the sites' current levels of protection against flood risk.	

Stage VII: Decommissioning the SDP Facilities **Coastal Change and Flood Risk**	
Technical Options: As the range of potential effects on this objective are expected to be similar to (or less than) Option 1, the influence of the technical options on their severity is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** None identified.	
Summary: Option 2 is assessed a having a neutral effect on the coastal change and flood risk objective as it is assumed that the reduction in hardstanding and impermeable surfaces on site will not be of a scale sufficient to reduce flood risk.. There is the potential that any flood alleviation or flood protection measures developed during the construction of the facilities would be left in situ, thus maintaining the sites' current levels of protection against flood risk.	**0**
Option 3: Decommission Licensed/Authorised Sites	
Assessment of Effects: It is generally assumed that decommissioning of SDP facilities constructed on Licensed/Authorised sites will reduce the potential risk of flooding through a return of sites to the previous state of land characterisation. Depending on the exact location of the facilities, there is potential that demolition could result in decreased flood risk as a result of reduced surface water runoff from the removal of hardstanding. Whilst site clearance, levelling and the removal of hardstanding may also reduce flood risk during the demolition phase and beyond, it is expected that changes to surface drainage patterns and the decrease in impermeable surface areas will be limited, as it is assumed that the vast majority of infrastructure will remain in place. As with Options 1 and 2, there is the potential that any flood alleviation or flood protection measures developed during the construction of the facilities would be left in situ thus maintaining the sites' current levels of protection against flood risk. **Technical Options:** As the range of potential effects on this objective are expected to be similar to (or less than) Options 1 and 2, the influence of the technical options on their severity is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** None identified.	
Summary: Option 3 has been assessed as having a neutral effect in relation to this objective. This is due to the fact that the scale of demolition and decommissioning of facilities on existing Licensed/Authorised sites will be limited and the consequential effects on surface run off patterns will similarly be limited. There is the potential that any flood alleviation or flood protection measures developed during the construction of the facilities would be left in situ, thus maintaining the sites' current levels of protection against flood risk.	**0**

9.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the coastal change and flood risk objective. **Box 9.2** provides a summary of the options that have been assessed.

Box 9.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 9.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities.	0/-	-	0/-	**Potential Effects** There is the potential for the construction of new SDP facilities to affect surface water run-off and flood risk, e.g. any site clearance and levelling, introduction of hardstanding or impermeable surfaces, or the construction of surface bunds from any excavated topsoil. However, as the Devonport and Rosyth dockyards predominantly comprise impermeable surfaces, and assuming that drainage systems would be incorporated in any new build as necessary, it is not anticipated that construction activities within the Devonport or Rosyth dockyards would involve significant levels of ground disturbance or significantly alter surface drainage patterns or run-off rates. Depending on submarine transport methods (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used) there is the potential for impacts on coastal processes and flood risk from any dredging or channel modifications *(refer to impacts specific to the Devonport and Rosyth dockyards).* However, it is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required. In addition, there is also the potential for submarine hull transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility for dismantling to indirectly impact on coastal processes and erosion rates (e.g. disturbance of coastal habitat or pollution from accidental spillage). Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have a localised impact on coastal processes and erosion rates, although the likelihood of such an event occurring is exceptionally small. Submarine docking operations involve flooding the DBV to dock the submarine and subsequently dewatering the dock. This process would involve the transfer of significant volumes of water into the dock from the basin, and subsequently back into the basin. However, as the water levels within the basin are controlled, and the docking of submarines is a routine procedure undertaken at the Devonport and Rosyth dockyards, these operations are not anticipated to affect existing flood risk. Docking activities at the Devonport and Rosyth dockyards are not anticipated to affect coastal processes or erosion rates assuming that water levels within the basin are controlled and that no dredging or channel modification works within the basins are required. However, there is the potential for effects if dewatering of the dock and drainage out of the basin was uncontrolled or if a significant pollution incident occurred that resulted in the displacement or loss of coastal habitats. Given their coastal location there is the potential for SDP activities at the Devonport and Rosyth dockyards to be at risk of flooding. Flooding may result in damage to facilities, disrupt activity, create health and safety risks and potentially mobilise pollutants and hazardous materials (*refer to impacts specific to the Devonport and Rosyth dockyards*). Of the technical options, the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2. Any impact on flood risk from the construction of SDP facilities could therefore be greater for the RC option as the extent of impermeable area, and potentially also ground disturbance (depending on facility design) would be greater. However, in the case of the RC option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for full dismantling would not take place until the interim storage period is nearing completion. Separating activities into two phases could help to ensure that run-off rates are not adversely affected. Notwithstanding this, a delay in beginning the full dismantling of the RC may mean that the increase in flood risk is more

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				likely to affect activities.
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	0/-	-	0/-	Devonport Dockyard EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Taking account of current flood risk to the site, SDP activities within Devonport dockyard are not anticipated to be at significant risk of flooding. However, there could be the potential for impacts during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation. Submarine sections can be transported to the commercial ship recycling facility following initial dismantling in a variety of ways including heavy lift vessel (although this is considered to be the least likely transport option to be implemented), submersible barge or tow (following welding to ensure that they are watertight). In the unlikely event that a heavy lift vessel is used to transport submarines to the dockyard or fore and aft sections to the commercial ship recycling facility, significant dredging would be required to create sufficient deep water (an estimated 300m wide area to a depth of 22-25+ metres would be required for heavy lift operations) which may impact on coastal processes and erosion rates due to the physical displacement of the bed of the estuary. There is also the potential for dredging operations and subsequent heavy lift operations within the estuary channel to be affected by flooding, most likely delaying operations. However, flooding may also result in damage to dredging and heavy lift vessel facilities, disrupt activity, create health and safety risks and potentially mobilise pollutants and hazardous materials. Notwithstanding this, any such impacts are expected to be limited to the duration of the channel modification and dredging and following completion, no further impacts on coastal processes are anticipated. Rosyth Dockyard SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Taking account of current flood risk to the dockyard SDP activities could be at significant risk of flooding, in particular during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. A Flood Risk Assessment has been undertaken as part of an Environmental Impact Assessment for the development of the land to the east of Rosyth dockyard, which highlighted the main risk to be from tidal inundation. Environmental data provided by SEPA for the land to the east of the dockyard indicates that during an extreme weather event water levels could rise to 4.52mAOD, which could inundate some areas of the site based on current ground levels.

Assessment Criteria	Score			Commentary
	1D	1R	1B	
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	0/-	-	0/-	Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. Notwithstanding this, if it is determined that dredging or channel modification is required to accommodate heavy lift operations there would be the potential for impacts on coastal processes and erosion rates, and potentially also flood risk, due to the physical displacement of the bed of the estuary. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 1D could therefore potentially have a greater impact on flood risk associated with construction activities within the dockyard. Notwithstanding this, taking account of the scale of development required, which is not anticipated to significantly alter drainage patterns and surface water run-off rates, there is not anticipated to be any significant difference in the scale of potential effects on flood risk from construction activities in the dockyards between the two sites. Given that the majority of the Rosyth dockyard lies within the floodplain, whereas only a small part of the Devonport dockyard lies within the floodplain SDP activities at Rosyth dockyard could be at greater risk of flooding. There is therefore considered to be a greater potential for adverse impacts with Option 1R in relation to flood risk. Depending on submarine transportation methods there could be a greater potential for submarine transportation activities at Devonport dockyard to affect and be affected by coastal change and flood risk when compared to Rosyth dockyard should dredging be required to accommodate heavy lift operations within the estuary channel by Devonport dockyard, which may not be required at Rosyth dockyard. However, it is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required. As SDP activities at Rosyth dockyard are at greater risk of being adversely affected by flooding when compared to Devonport dockyard, with the potential for significant effects in a extreme weather event, overall there is considered to be a greater potential for adverse impacts with Option 1R in relation to coastal change and flood risk. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster initial dismantling of submarines, which may reduce the potential for SDP activities to be affected by coastal change and flooding. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. This may reduce the potential for submarine transportation to be affected by flooding.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities.	0/-	-	0/-	**Potential Effects** There is the potential for the construction of new SDP facilities to affect surface water run-off and flood risk, e.g. any site clearance and levelling, introduction of hardstanding or impermeable surfaces, or the construction of surface bunds from any excavated topsoil. However, as the Devonport and Rosyth dockyards predominantly comprise impermeable surfaces, and assuming that drainage systems would be incorporated in any new build as necessary, it is not anticipated that construction activities within the Devonport or Rosyth dockyards would involve significant levels of ground disturbance or significantly alter surface drainage patterns or run-off rates. It is assumed that the submarines would be towed into/out of the dockyard avoiding the need for dredging. There is the potential for submarine hull transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility for dismantling to indirectly impact on coastal processes and erosion rates (e.g. from disturbance of coastal habitat or pollution from accidental spillage). Prior to movement the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have a very localised impact on coastal processes and erosion rates, although the likelihood of such an event occurring is exceptionally small. Submarine docking operations involve flooding the DBV to dock the submarine and subsequently dewatering the dock. This process would involve the transfer of significant volumes of water into the dock from the basin, and subsequently back into the basin. However, as the water levels within the basin are controlled, and the docking of submarines is a routine procedure undertaken at the Devonport and Rosyth dockyards, these operations are not anticipated to affect existing flood risk. Given their coastal location there is the potential for SDP activities at the Devonport and Rosyth dockyards to be at risk of flooding. Flooding may result in damage to facilities, disruption of activity, health and safety risks and the potential mobilisation of pollutants and hazardous materials (*refer to impacts specific to the Devonport and Rosyth dockyards*).
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	0/-	-	0/-	Of the technical options, the scale of development required for the RPV option would be smaller than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2 and thus a smaller impermeable area. The RPV option could therefore have the least impact on flood risk associated with the construction of SDP facilities within the dockyards when compared to the other technical options. In addition, in the case of the RPV option construction of SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for full dismantling of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases could help to ensure that run-off rates are not adversely affected. Notwithstanding this, a delay in beginning the full dismantling of the RPV may mean that the increase in flood risk is more likely to affect activities. <u>Devonport Dockyard</u> EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Taking account of current flood risk to the site, SDP activities within Devonport dockyard are not anticipated to be at significant risk of flooding. However, there could be the potential for impacts during an extreme weather event, such as a storm surge, tsunami, wind induced

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				waves from high winds, hurricanes and tornadoes or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation. <u>Rosyth Dockyard</u> SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding.
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	0/-	-	0/-	Taking account of current flood risk to the dockyard SDP activities could be at significant risk of flooding, in particular during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. A Flood Risk Assessment has been undertaken as part of an Environmental Impact Assessment for the development of the land to the east of Rosyth dockyard, which highlighted the main risk to be from tidal inundation. Environmental data provided by SEPA for the land to the east of the dockyard indicates that during an extreme weather event water levels could rise to 4.52mAOD, which could inundate some areas of the site based on current ground levels. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 2D could therefore potentially have a greater impact on flood risk associated with construction activities within the dockyards. Notwithstanding this, taking account of the scale of development required, which is not anticipated to significantly alter drainage patterns and surface water run-off rates, there is not anticipated to be any significant difference in the scale of potential effects on flood risk from construction activities within the dockyards between the two sites. Given that the majority of the Rosyth dockyard lies within the floodplain, whereas only a small part of the Devonport dockyard lies within the floodplain SDP activities at Rosyth dockyard could be at greater risk of flooding. There is therefore considered to be a greater potential for adverse impacts with Option 2R in relation to flood risk. As SDP activities at Rosyth dockyard are at greater risk of being adversely affected by flooding when compared to Devonport dockyard, with the potential for significant effects in an extreme weather event, overall there is considered to be a greater potential for adverse impacts with Option 2R in relation to coastal change and flood risk.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	0/-	-	0/-	<u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster initial dismantling of submarines, which may reduce the potential for SDP activities to be affected by coastal change and flooding. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. This may reduce the potential for submarine transportation to be affected by flooding.

Options 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	-/?	-/?	-/?	At this stage a site for interim storage has not been identified and subsequently the potential for interim storage and subsequent size reduction activities to affect or be affected by flood risk or coastal change cannot be determined at this stage. Of the technical options, the scale of development required for the RPV option would be smaller than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2 and thus a smaller impermeable area. The RPV option could therefore have the least impact on flood risk associated with construction when compared to the other technical options. In addition, construction would also take place on two different sites, reducing any impacts from SDP activities as the scale of activity undertaken at the respective sites would be less. In the case of the RPV option, construction of SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for full dismantling of the RPV would not take place until the interim storage period is nearing completion. This would mean that construction would be spread over two phases rather than one period. Separating activities into two phases could help to ensure that run-off rates are not adversely affected. Notwithstanding this, depending on the location of the remote site a delay in beginning the full dismanlting of the RPV may increase the potential for activities to be affected by flood risk and coastal change. <u>Devonport Dockyard</u> EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Taking account of current flood risk to the site, dismantling activities within Devonport dockyard are not anticipated to be at significant risk of flooding. However, there could be the potential for impacts during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	-/?	-/?	-/?	<u>Rosyth Dockyard</u> SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Taking account of current flood risk to the dockyard SDP activities could be at significant risk of flooding, in particular during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. A Flood Risk Assessment has been undertaken as part of an Environmental Impact Assessment for the development of the land to the east of Rosyth dockyard, which highlighted the main risk to be from tidal inundation. Environmental data provided by SEPA for the land to the east of the dockyard indicates that during an extreme weather event water levels could rise to 4.52mAOD, which could inundate some areas of the site based on current ground levels. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. **<u>Comparison of the Options</u>** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. Notwithstanding this, given that the majority of the Rosyth dockyard lies within the floodplain, whereas only a small part of the Devonport dockyard lies within the floodplain. dismantling activities at Rosyth dockyard could therefore be at greater risk of flooding when compared to Devonport dockyard. There is therefore considered to be a greater potential for adverse impacts with Option 3/4R in relation to flood risk. As SDP activities at Rosyth dockyard are at greater risk of being adversely affected by flooding when compared to Devonport dockyard, with the potential for significant effects in an extreme weather event, overall there is considered to be a greater potential for adverse impacts with Option 3/4R in relation to coastal change and flood risk. At this stage a remote site for interim storage has not been identified and subsequently the potential for interim storage and size reduction activities to affect or be affected by coastal change and flood risk is uncertain. The potential for effects would depend on the location of the remote site, the existing facilities and infrastructure in place, and the scale of development required.
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	-/?	-/?	-/?	<u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised for dismantling, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites for dismantling would enable faster initial dismantling of submarines, which may reduce the potential for dismantling activities to be affected by coastal change and flooding. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities.	0/-	-	0/-	**Potential Effects** There is the potential for the construction of new SDP facilities to affect surface water run-off and flood risk, e.g. any site clearance and levelling, introduction of hardstanding or impermeable surfaces, or the construction of surface bunds from any excavated topsoil. However, as the Devonport and Rosyth dockyards predominantly comprise impermeable surfaces, and assuming that drainage systems would be incorporated in any new build as necessary, it is not anticipated that construction activities within the Devonport and Rosyth dockyards would involve significant levels of ground disturbance or significantly alter surface drainage patterns or run-off rates. It is expected that submarines will be towed to/from the dockyards for dismantling such that dredging is unlikely to be required. There is also the potential for submarine hull transportation to and from the Devonport and Rosyth dockyards and to the commercial ship recycling facility for dismantling to indirectly impact on coastal processes and erosion rates. Prior to movement, the submarines would have undergone preparation for safe transportation and so it is assumed that there would be no emissions or releases from the submarine during transport. In the case of transporting the submarine from the dockyard to the ship recycling facility, the radioactive elements of the submarines would have been removed. In the event of an accident (a collision event, grounding or a major fire event), there is the potential for the hull to be breached, and any contained contaminants mobilised which could have a localised impact on coastal processes and erosion rates, although the likelihood of such an event occurring is exceptionally small.
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	0/-	-	0/-	Submarine docking operations involve flooding the DBV to dock the submarine and subsequently dewatering the dock. This process would involve the transfer of significant volumes of water into the dock from the basin, and subsequently back into the basin. However, as the water levels within the basin are controlled, and the docking of submarines is a routine procedure undertaken at the Devonport and Rosyth dockyards, these operations are not anticipated to affect existing flood risk. Given their coastal location there is the potential for SDP activities at the Devonport and Rosyth dockyards to be at risk of flooding. Flooding may result in damage to facilities, disruption of activity, health and safety risks and the potential mobilisation of pollutants and hazardous materials (*refer to impacts specific to the Devonport and Rosyth dockyards*). Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2 with the potential for a greater level of disturbance and resulting in a larger impermeable area when compared to the RPV option, but less than that of the RC option. Any impact on flood risk during construction for the PW option could therefore be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full early dismantling of the RPV and segregating the ILW and LLW prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on flood risk from SDP activities as levels of activity and disturbance would be greater. Devonport Dockyard EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Taking account of current flood risk to the site, SDP activities within Devonport dockyard are not anticipated to be at significant risk of flooding. However, there could be the potential for impacts during an extreme weather event, such as a storm surge, tsunami, wind induced

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				waves from high winds, hurricanes and tornadoes or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation.
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	0/-	-	0/-	Rosyth Dockyard SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Taking account of current flood risk to the dockyard SDP activities could be at significant risk of flooding, in particular during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. A Flood Risk Assessment has been undertaken as part of an Environmental Impact Assessment for the development of the land to the east of Rosyth dockyard, which highlighted the main risk to be from tidal inundation. Environmental data provided by SEPA for the land to the east of the dockyard indicates that during an extreme weather event water levels could rise to 4.52mAOD, which could inundate some areas of the site based on current ground levels. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 5D could therefore potentially have a greater impact on flood risk associated with construction activities within the dockyards when compared to Option 5R. Notwithstanding this, taking account of the scale of development required, which is not anticipated to significantly alter drainage patterns and surface water run-off rates, there is not anticipated to be any significant difference in the scale of potential effects on flood risk from construction activities within the dockyards between the two sites. Given that the majority of the Rosyth dockyard lies within the floodplain, whereas only a small part of the Devonport dockyard lies within the floodplain. SDP activities at Rosyth dockyard could therefore be at greater risk of flooding. There is therefore considered to be a greater potential for adverse impacts with Option 5R in relation to flood risk when compared to Option 5B.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	0/-	-	0/-	As SDP activities at Rosyth dockyard are at greater risk of being adversely affected by flooding when compared to Devonport dockyard, with the potential for significant effects in an extreme weather event, overall there is considered to be a greater potential for adverse impacts with Option 5R in relation to coastal change and flood risk. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage.

Options 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	0/-/?	0/-/?	0/-/?	Submarine docking operations involve flooding the DBV to dock the submarine and subsequently dewatering the dock. This process would involve the transfer of significant volumes of water into the dock from the basin, and subsequently back into the basin. However, as the water levels within the basin are controlled, and the docking of submarines is a routine procedure undertaken at the Devonport and Rosyth dockyards, these operations are not anticipated to affect existing flood risk. Given their coastal location there is the potential for dismantling, and size reduction activities at the Devonport and Rosyth dockyards to be at risk of flooding. Flooding may result in damage to facilities, disruption of activity, health and safety risks and the potential mobilisation of pollutants and hazardous materials (*refer to impacts specific to the Devonport and Rosyth dockyards*). At this stage a remote site for interim storage has not been identified and subsequently the potential for interim storage activities to affect or be affected by flood risk or coastal change cannot be determined at this stage. Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2 with the potential for a greater level of disturbance and resulting in a larger impermeable area when compared to the RPV option, but less than that of the RC option. For the PW option any impact on flood risk during construction could therefore be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full dismantling of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for SDP activities to affect surface water run-off and flood risk as levels of activity would be greater. Notwithstanding this, completing construction in one phase would help to reduce the time period over which impacts could occur and would also reduce the potential for activities to be affected by flood risk and coastal change. Undertaking SDP activities on three different sites could also help to reduce disturbance levels. <u>Devonport Dockyard</u> EA flood maps show that a small stretch of the North Yard of Devonport dockyard (comprising the Western Promontory fronting the estuary), and land to the east of the Basin fronting the estuary lie within the 1 in 75yr (0.3% annual probability) floodplain, highlighting that these areas of the dockyard are at high risk of flooding. The remainder of the dockyard is in Flood Zone 1. Taking account of current flood risk to the site, dismantling activities within Devonport dockyard are not anticipated to be at significant risk of flooding. However, there could be the potential for impacts during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. Absolute sea level (i.e. corrected for land movement) around the South West has risen by around 1 mm/yr over the 20th Century. The South West Climate Change Partnership estimates a total sea level rise of 900mm by 2100 due to climate change, with Plymouth expected to see the greatest flood risk in the South West in the future. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard and this is expected to be the preferred method of transportation.
I. Coastal Change and Flood Risk Minimise the risks from coastal	0/-/?	0/-/?	0/-/?	<u>Rosyth Dockyard</u> SEPA flood maps show that the Rosyth dockyard is predominantly located within the 1 in 200yr (0.5% annual probability) floodplain, highlighting that the dockyard may be at medium to high risk of coastal flooding. Taking account of current flood risk to the dockyard SDP activities could be at significant

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
change and flooding to people, property and communities. *(continued)*				risk of flooding, in particular during an extreme weather event, such as a storm surge, tsunami, wind induced waves from high winds, hurricanes and tornadoes or an exceptionally severe localised rainstorm with a very high return period that resulted in a breach of the drainage system on-site or in the immediate area. Sea level rise as a result of climate change could also increase the risk of flooding. A Flood Risk Assessment has been undertaken as part of an Environmental Impact Assessment for the development of the land to the east of Rosyth dockyard, which highlighted the main risk to be from tidal inundation. Environmental data provided by SEPA for the land to the east of the dockyard indicates that during an extreme weather event water levels could rise to 4.52mAOD, which could inundate some areas of the site based on current ground levels. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option6D could therefore potentially have a greater impact on coastal change and flood risk associated with construction activities within the dockyards. Given that the majority of the Rosyth dockyard lies within the floodplain, whereas only a small part of the Devonport dockyard lies within the floodplain. SDP activities at Rosyth dockyard could therefore be at greater risk of flooding when compared to Devonport dockyard. There is therefore considered to be a greater potential for adverse impacts with Option 6/8R in relation to flood risk. It is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required.
I. Coastal Change and Flood Risk Minimise the risks from coastal change and flooding to people, property and communities. *(continued)*	0/-/?	0/-/?	0/-/?	As SDP activities at Rosyth dockyard are at greater risk of being adversely affected by flooding when compared to Devonport dockyard, with the potential for significant effects in an extreme weather event, overall there is considered to be a greater potential for adverse impacts with Option 6/8R in relation to coastal change and flood risk. At this stage a remote site for interim storage has not been identified and subsequently the potential for interim storage activities to affect or be affected by coastal change and flood risk is uncertain. The potential for effects would depend on the location of the remote site, the existing facilities and infrastructure in place, and the scale of development required. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage.

A10. Material Assets - Transport

10.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on transport. Information is presented for both national and sub-regional levels.

Transport can be provided by various modes, such as air, rail, road and water. Traffic within this context is defined as the aggregation of pedestrians or vehicles coming to or leaving from a particular locality and transport is the movement of people and goods from one place to another.

There are links between the transport topic and other topics in the SEA, specifically population, human health and wellbeing, human health (noise), air, climate change and energy use and waste management.

10.2 Summary of Plans and Programmes

10.2.1 International

The European Union requires an Environmental Impact Assessment to be carried out before approval can be granted for certain public and private projects. ***Directive 85/337/EEC on the Assessment of the Effects of Certain Public and Private Projects on the Environment (as amended by Directive 97/11/EC)*** lists the projects concerned, the information to be provided and the third parties to be consulted in connection with approving such a project. An assessment is obligatory for transport infrastructure such as railways, airports, motorways, inland waterways and ports when the infrastructure exceeds certain specific thresholds.

International Maritime Dangerous Goods Code (2009) sets out a uniform code for the transport of dangerous goods by sea covering such matters as packing, container traffic and stowage, with particular reference to the segregation of incompatible substances. The Code regulates sea transport of hazardous materials to ensure the safe transportation of dangerous goods and to prevent marine-pollution. The ***European Agreement Concerning the International Carriage of Dangerous Goods***

by Road (the ADR Regulations) (2010) sets out high level aims, duties and provisions for the carriage of dangerous goods in Europe.

The ***Renewable Energy Directive (2009)*** imposes stretching renewables targets for 2020 across the EU, including: 10% of energy used in transport to be renewable; and a minimum reduction in greenhouse gas emissions from road transport of 6%.

10.2.2 National

UK

The Planning Act (2008) introduces a new system for nationally significant infrastructure planning, alongside further reforms to the Town and Country Planning system. A major component of this legislation is the introduction of an independent Infrastructure Planning Commission (IPC), to take decisions on major infrastructure projects (transport, energy, water and waste). To support decision making, the IPC will refer to the Government's National Policy Statements (NPSs), which will provide a clear long-term strategic direction for nationally significant infrastructure development.

The Local Transport Act (2008) empowers local authorities to take appropriate steps to meet local transport needs in the light of local circumstances.

Delivering a Sustainable Transport System (2008) sets out Government strategy for transport focusing on the challenge of delivering strong economic growth while reducing greenhouse gas emissions and includes the following objectives;

- to support national economic competitiveness and growth, by delivering reliable and efficient transport networks;
- to reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of tackling climate change;
- to contribute to better safety and health and longer life-expectancy by reducing the risk of death, injury or illness arising from transport and by promoting travel modes that are beneficial to health; and
- to improve quality of life for transport users and non-transport users, and to promote a healthy natural environment.

The Road Safety Act (2006) makes provision about road traffic, registration plates, vehicle and driver information, hackney carriages and private hire vehicles, and trunk road picnic areas. ***The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (SI 2009/1348)*** sets out measures to regulate the carriage of dangerous goods by road and rail in Great Britain.

MOD Sustainable Development Strategy (2009) and ***MOD Climate Change Strategy (2009,2010)*** include targets relevant to transport, such as;

- to achieve a continued reduction in air, road and rail business administration travel by MOD personnel;
- to reduce the use of marine, land and aviation fuels as much as is reasonably practicable without impacting on operational capability, whilst at the same time assessing the viability of alternatives to those fuels;
- develop a Defence Travel Emissions Strategy with targets and actions for all modes of transport; and
- to reduce emissions from road vehicles by 15% by 2010 against a 2005/06 baseline; and
- by 2010 to have an average new car emission level of 130g/km.

England

In England, ***Planning Policy Guidance 13: Transport*** provides guidance for planning authorities with regard to accessibility of development. It seeks to reduce the need to travel, especially by car and includes objectives to promote accessibility to jobs, shopping, leisure facilities and services by public transport, walking and cycling and to promote more sustainable transport choices for people and for the movement of freight.

Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1 (2007), which sets out how spatial planning should contribute to reducing emissions and stabilising climate change and take into account the unavoidable consequences. It aims to Deliver patterns of urban growth and sustainable rural developments that help secure the fullest possible use of sustainable transport for moving freight, public transport, cycling and walking; and, which overall, reduce the need to travel, especially by car.

Scotland

Scottish Planning Policy (2010) sets out objectives to meet European and UK commitments and targets on greenhouse gases, maintain and enhance the natural and built environment, through avoiding or mitigating adverse environmental impacts, reinforce the rural economy and way of life; and ensure that the impact of development proposals on transport networks does not compromise their safety or efficiency. Scottish Planning Policy is supported by ***Planning Advice Note 75 (PAN75): Planning for Transport***, published by the Scottish Executive, which aims to create greater awareness of how linkages between planning and transport can be managed.

Scotland's National Transport Strategy (2006) has a range of objectives which in turn seek to improve journey times and connections, thus making it quicker and easier to travel between towns and cities, whilst taking a lead in the future of sustainable modes of transport, whilst ensuring that everyone across Scotland has high quality public transport choices. Indicators within this strategy document are directly related to greenhouse gas emissions from transport as well as by transport sector, transport activity figures and the average distance travelled by Scottish residents.

Wales

Planning Policy Wales (PPW) (Edition 2 (2010) sets out the land use planning policies of the Welsh Assembly Government. Regarding transport, there are several objectives including promoting sustainable transport for freight and commerce, supporting sustainable transport options in rural areas, supporting necessary infrastructure improvements and ensuring that, as far as possible, transport infrastructure does not contribute to land take, urban sprawl or neighbourhood severance.

Technical Advice Note 18: Transport (2007) describes how to integrate land use and transport planning, and ***Technical Advice Note 12: Design (2009)*** sets out the Welsh Assembly Government's policies and objectives in respect of the design of new development, which, in relation to transport, includes an objective to promote sustainable means of travel

One Wales: Connecting the Nation, the Wales Transport Strategy (2008) sets out the strategy for transport in Wales, identifying a series of high-level outcomes and sets out the steps to their delivery. The Strategy is supported by the ***National Transport Plan (2010)***, which sets out the detail of how the Wales Transport Strategy will be delivered over the next five years. The National Transport Plan has five strategic priorities over the next five years until 2015; reducing greenhouse gas emissions and other environmental impacts; integrating local transport; improving access between key settlements and sites; enhancing international connectivity; and increasing safety and security.

Northern Ireland

Planning Policy Statement 13 Transportation and Land Use (2005) has been prepared to assist in the implementation of the Regional Development Strategy (RDS) to guide the integration of transportation and land use. The need to integrate land use and transportation is a key objective in delivering the transportation vision as set out in the RDS; 'to have a modern, sustainable, safe transportation system which benefits society, the economy and the environment and which actively contributes to social inclusion and everyone's quality of life.'.

The Northern Ireland Regional Transport Strategy (RTS) 2002-2012 identifies strategic transportation investment priorities and considers potential funding sources and affordability of planned initiatives over the next 10 years. The Strategy is supported by the ***Regional Strategic Transport Network Transport***

Plan 2015, which takes a realistic view of the scale of possible investment by closely following the funding levels envisaged in the Regional Transport Strategy, which have been extrapolated to match the longer period of the plan.

10.2.3 Sub-regional locations

Plymouth

The ***Plymouth City Council (2006) Local Transport Plan 2006 to 2011*** has objectives to improve; accessibility and social inclusion, road safety, air quality and the environment and quality of life. Further to these improvements it also seeks to reduce the rate of growth of traffic and support urban renaissance and sustainable growth. The Plymouth City Strategy and Action Plan have set a target of enabling 60% of journeys within the City to be undertaken by foot, bicycle or by public transport by 2010.

Fife

The Local Transport Strategy for Fife 2006-2026 and the Fife Structure Plan 2006-2026 - Proposal PT1: Transport Proposals both contain policy messages which consider the importance of being able to improve access to all key services; limit the growth in the use of driver only car trips; encourage more sustainable travel for new and existing developments; promote efficient movement of freight; and encourage transfer of freight goods from road to rail, sea and pipeline.

10.3 Overview of the Baseline

10.3.1 National

UK

The UK is a small land mass with its urban centres geographically close to each other. The historic, organic growth of the UK's transport networks is linked to this geographic proximity. The UK's urban centres are served by 'dense and inter-twined road networks'[105] which reflect the historic development of these inter urban road links. For many urban centres rail links are also present. As the UK's economy has developed, facilitated in part by technological advances, the rural/urban demographic of the UK has changed. This change has resulted in an increase in the volume of traffic on certain transport links (urban hubs) and is much greater than the function for which they were originally intended.

[105] Department for Transport (2006) The Eddington Transport Study (Section 2). Available online at: http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/

Principal roads

The UK has a network of Motorways and A-roads with provide good connectivity between regions and urban centres. There was a significant decrease in Heavy Goods Vehicle (HGV) activity in 2009, with the amount of goods moved decreasing by 13% from the 2008 level to 132 billion tonne kilometres, the amount of goods lifted decreasing by 18% to 1,422 million tonnes and vehicle kilometres decreasing by 11% to 18.8 billion vehicle kilometres (11.7 billion vehicle miles).[106] In 2009, the overall motor vehicle traffic volume in Great Britain was 313.2 billion vehicle miles, down by 3.0 billion vehicle miles from last year.[107]

Principal rail lines

The UK has a network of main line rail connections with plans to improve capacity and track speeds. The volume of freight transported by rail has increased from 16.9 billion tonne kilometres in 1997 to 20.6 billion tonne kilometres in 2008/9. Over the last 10 years, the percentage of domestic freight being transported by rail increased by one percentage point (up to 8% of total freight movements). However, over the past 55 years rail freight volumes have generally been in decline to 57% of those seen in 1953. [108]

Principal airports

There are 30 'major' airports in the UK. In 2008 there were 2,327,000 air traffic movements in Great Britain. Major UK airports include Heathrow, Gatwick, Stansted, East Midlands, Manchester, Glasgow, Aberdeen and Belfast.[109]

Principal ferry ports

Major UK sea ports include: Sullom Voe; Forth; Tees and Hartlepool; Hull; Grimsby and Immingham; Felixstowe; Harwich; London; Ramsgate; Dover; Portsmouth; Southampton; Milford Haven; Holyhead; Liverpool.8 In 2009, 107 million tonnes of domestic freight was moved by water. In the last 10 years the amount of domestic freight transported by water has remained relatively constant at around 50 billion tonne kilometres which represents approximately 20% of the domestic freight movements.[110]

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[106] http://www.dft.gov.uk/pgr/statistics/datatablespublications/freight/goodsbyroad/roadfreightstatistics2009
[107] http://www.dft.gov.uk/pgr/statistics/datatablespublications/roadstraffic/speedscongestion/roadstatstsc/roadstats09tsc
[108] http://www.networkrail.co.uk/aspx/1530.aspx
[109] http://www.dft.gov.uk/pgr/statistics/datatablespublications/aviation/tsgb2009aviationtables.xls
[110] http://www.dft.gov.uk/adobepdf/162469/221412/221658/223721/669555/maritimestatistics2009.pdf

MOD

As of 2010, the MOD has the freehold to 1,000Ha of Naval Base land,[10] principally at Faslane, Coulport and Marchwood. The Naval Bases at Portsmouth and Devonport are now largely contractor-owned. This has decreased from 1,400Ha in 1997 and is set to reduce further as a result of the SDSR.

England

Principal roads

The total road length in England in 2009 was 301,187 km, unclassified roads contribute to 60% of the total roads at 181,661 km, the length of motorway was 3012km. [111]

The average traffic speed over the whole road network in England was 55.9 mph in 2008. [112]

Principal rail lines

In 2008 on a typical day 2.454 million journeys were estimated to depart from English stations.[113] Rail travel is concentrated in London and the South East; London alone accounted for just under half 48 per cent of all UK rail departures with the South East at 14 per cent. 8 per cent of journeys were made from the East of England and 7 per cent from each of Scotland and the North West.[113]

There are a number of other regions where the vast majority of rail travel sits within the region: North West (81%), Yorkshire & Humberside (75%), and the West Midlands (75%). However, in other regions a low proportion of the rail travel stays within the region, such as the South East (38%) and the East of England (21%), in these regions a high proportion of their travel is to London (72% from the East of England and 55% from the South East).[113]

Principal airports

Heathrow is the busiest airport in the UK with 68 million passengers in 2007. In 2009 Heathrow handled 22% of the UK's total air transport movements, 30% of terminal passengers and 62% of freight tonnes.[115] Heathrow also handled the majority of transfer passengers at UK airports; in 2009 38% of passengers at Heathrow were transfers.[114] The other major airports in London are Gatwick, Luton, Stansted and London City.

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[111] Dft http://www.dft.gov.uk/pgr/statistics/datatablespublications/roads/condition/inkilometres/rdl0201.xls
[112] DfT Road Statistics (2009) http://www.dft.gov.uk/pgr/statistics/datatablespublications/roadstraffic/speedscongestion/roadstatstsc/roadstats09tsc
[113] DfT National Rail Survey (2010) http://www.dft.gov.uk/pgr/statistics/datatablespublications/railways/nrtsupdate.pdf
[114] DfT (2010) Transport Statisitics: Aviation Summary http://www.dft.gov.uk/pgr/statistics/datatablespublications/tsgb/latest/tsgb2010aviation.pdf

Stansted and Manchester airports are the next busiest airports in England following Heathrow at 24 and 22 million passengers respectively in 2007.[115]

Other major airports within England include; Newcastle International, Durham Tees Valley, Humberside International, Leeds Bradford International, Blackpool, Liverpool John Lennon, Robin Hood Doncaster Sheffield, Birmingham International, Northwich, Bristol International, Exeter International, Newquay, Plymouth City and Southampton International.[116]

Principal ferry ports

Dover is the largest ferry port in England and the UK and handled 13 million passengers in 2010, constituting approximately 60% of all ferry journeys within the UK. This value is virtually unchanged from 2009 and 18 per cent lower than in 2000.[117] Dover to Calais is by far the busiest UK ferry route, handling 47 per cent of all UK international ferry passengers in 2010. Total passenger numbers of 10 million were virtually unchanged compared with 2009. Sailings between Dover and Calais carried 65 per cent of all sea passenger traffic between the UK and France.

After Dover Portsmouth is the next busiest port with 2.2 million passengers in 2010, a 3% increase compared to 2009.

Scotland

Principal roads

There were 55,838km of public road in Scotland on 1 April 2009. Unclassified roads accounted for almost half the road network - 26,446km. There are over 36,189km of roads with a speed limit of over 40 mph, which accounts for about two-thirds of the total network.

The length of motorway (excluding slip roads) has risen from 369km in 1998 to 391km in 2008. Between 1998 and 2008 the total length of the public road network increased by 1,849km (3%), from 55,325km in 1998 to 55,838km in 2008, mainly due to a rise of 1,413km in the total length of unclassified roads with a speed limit of up to 40 mph.[118]

[115] ONS (2009) http://www.statistics.gov.uk/cci/nugget.asp?id=1104
[116] DfT Major airports in UK http://www.dft.gov.uk/pgr/statistics/datatablespublications/aviation/activity-airports/avi0108.xls
[117] http://www.dft.gov.uk/pgr/statistics/datatablespublications/maritime/passengers/latest/seapass.pdf
[118] http://www.scotland.gov.uk/Topics/Statistics/Browse/Transport-Travel/TrendRoadNetwork

Principal rail lines

Scotland's rail network has around 340 railway stations and 3,000km of track; over 81 million passenger journeys are made on the network each year.[119] Rail freight has increased slightly from the mid-1990s "all-time low", to around 9-14 million tonnes in recent years.[120] ScotRail passenger numbers totalled 83.9 million in 2008/09, an increase of 3% from the previous year, a 44% rise since 1998/99 and a rise of 68% since 1992/93 when records began. In the 2008 Scottish Household Survey, 91% agreed that the trains were on time, 83% agreed that services ran when the person needed them, and 55% agreed that the fares were good value.[121]

Principal airports

There were 24.3 million air terminal passengers in 2008, around 0.8 million (3%) less than the previous year and the third highest level ever recorded. There has been almost continuous growth from 1.2 million in 1960, with increases in all but six of the years since then. In 2008, more than half the passengers who used Scottish airports were travelling to or from other UK airports - principally London Heathrow (3.1 million), Gatwick (1.6 million), Stansted (1.2 million), Luton (0.9 million), Belfast (0.8 million) and Birmingham (0.9 million). International passenger numbers were greatest for flights to/from Amsterdam (1.1 million), Dublin (0.9 million) and Paris, Charles de Gaulle (0.5 million).[122]

Principal ferry ports

In 2008 there were 6.785 million passengers within and to and from Scotland. The most heavily-used routes were: Wemyss Bay - Rothesay (741,000); Largs - Cumbrae (711,000); Ardrossan - Brodick (707,000); Oban - Craignure (554,000) and Gourock - Dunoon (551,000). There were 1.9 million passenger journeys between Scotland and Northern Ireland in 2008: 1.1 million on the Stranraer - Belfast route, 628,000 on Cairnryan - Larne and 206,000 on Troon - Larne. The service between Troon and Belfast was withdrawn in December 2004. The numbers of cars carried on these routes (in 2008) were: 239,000 for Stranraer - Belfast ; 154,000 for Cairnryan - Larne and 59,000 for Troon - Larne. The tonnage lifted in Scotland by coastal shipping when measured in "tonne-kilometres" shipping is around 14-17 billion.[123]

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[119] http://www.transportscotland.gov.uk/rail-information
[120] http://www.scotland.gov.uk/Topics/Statistics/Browse/Transport-Travel/TrendRailFreight
[121] http://www.scotland.gov.uk/Topics/Statistics/Browse/Transport-Travel/TrendRailServices
[122] http://www.scotland.gov.uk/Topics/Statistics/Browse/Transport-Travel/TrendAirServices
[123] http://www.scotland.gov.uk/Topics/Statistics/Browse/Transport-Travel/TrendWaterwaysPipelines

Wales

Principal roads

The total road length in Wales in 2009 was 34,164km. Unclassified minor surfaced roads contribute approximately half the total road length in Wales. The greatest length of motorway is in Newport, which accounts for 19% of the total motorway in Wales. In 2009, 4.3% of the motorway network and 5.8% of the trunk road network required close monitoring of structural condition compared with 4.6% and 6.2% respectively in 2008.[124]

It is estimated that the volume of motor vehicle traffic on all roads in Wales in 2008 was similar to that in 2007. The volume of traffic has however grown by almost 14% since 1999. Traffic on minor roads accounted for 37% of all traffic. Traffic on motorways accounted for 12% of all road traffic during 2008.[125]

The National Travel Survey estimated that on average around 1,000 trips are made in Wales, per person, per year, with people travelling an average distance of almost 140 miles a week. Approximately seven out of ten trips are made in either a car or a van. According to the Labour Force Survey more than four out of five people use a car, van, or minibus as their main mode of travel to work, with a further one in ten people choosing to walk.

Principal rail lines

There were approximately 25.3 million rail passenger journeys which either started or ended in Wales in 2008-09, an increase of 6% compared to the previous year. During 2008-09, Cardiff was the destination of almost two-fifths (39%) of rail passenger journeys within Wales.[126]

Principal airports

There is only one domestic airport within Wales which is Cardiff Airport. In 2009 aircraft movements at Cardiff International Airport were 27% fewer than in 2008. The total number of passengers using Cardiff International Airport decreased by 18% in 2009 to 1.63 million.[127]

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[124] http://wales.gov.uk/docs/statistics/2009/091027wts2009ch1ency.pdf
[125] http://wales.gov.uk/docs/statistics/2009/091110wts2009ch7ency.pdf
[126] http://wales.gov.uk/docs/statistics/2010/101006wts2009ch9ency.pdf
[127] http://wales.gov.uk/docs/statistics/2009/091027wts2009ch6ency.pdf

Principal ferry ports

In 2008 there were 8,605 ship arrivals in Wales. This number has been in decline for the last five years with a reduction over the period of 22%. There are 10 principal ferry ports in Wales with two of these accounting for 2/3 of the ship arrivals in Wales, namely Milford Haven and Holyhead. In 2008 there were over 55 million tonnes of goods and foreign and domestic traffic in ports in Wales.[128]

Northern Ireland

Principal roads

In 2010 there were 25,247km of public road in Northern Ireland. Unclassified roads accounted for the largest proportion of all roads (60%) followed by C roads (19%), B roads (11%), A roads (9%) and Motorways (<1%). Analysis of the urban/rural split of the road network reveals that 21% of road lengths are urban (speed limit of 40 mph or less) and 79% are rural (speed limit of more than 40 mph). This varies between the different road types with C roads having the highest proportion of rural road length (94%) and unclassified roads having the lowest proportion of rural road length (73%). During 2009, 57.4 million tonnes of freight were lifted within Northern Ireland and transported by road in goods vehicles weighing over 3.5 tonnes, a decrease of 16% from 2008. Crude minerals (e.g. sand, gravel) were the greatest single commodity transported within Northern Ireland and accounted for 16.5 million tonnes, 29% of all tonnes moved.[129]

Principal rail lines

Northern Ireland has 211 route miles of track and 22 stations. During 2009-10, there were 10.0 million rail passenger journeys made, a decrease of 2% from 2008-09. Railway passenger receipts also decreased, from £29.0 to £28.5 million, a decrease of 2%.[130]

Principal airports

Between 2008 and 2009, air transport movements at Belfast International Airport decreased by 18%, George Best Belfast City Airport decreased by 6% and City of Derry Airport decreased by 28%. In 2009, Belfast International Airport accounted for 51% of all air transport movements, George Best Belfast City Airport 44% and City of Derry Airport 5%. Of the 85,849 air transport movements occurring during 2009,

[128] http://wales.gov.uk/docs/statistics/2010/100420wts2009ch11ency.pdf
[129] http://www.drdni.gov.uk/index/statistics/stats-%20catagories/ni_transport_statistics.htm
[130] http://www.drdni.gov.uk/index/statistics/stats-%20catagories/ni_transport_statistics.htm

92% were scheduled and 8% were chartered. During 2009, 7.5 million terminal passengers passed through Northern Ireland airports, representing a decrease of 9% on the 2008 figure. [131]

Principal ferry ports

There are three major ports in Northern Ireland namely, Belfast, Larne and Warrenpoint which saw 2.2 million sea passengers travelled between Northern Ireland and Great Britain ports during 2009 with an additional 19,000 travelling by sea between Northern Ireland and the Isle of Man. [21]

In 2009 the most frequently used method of travel to work in Northern Ireland was car, van or minibus, with 86% of the workforce interviewed in October to December using these methods. This compares to 71% in the United Kingdom as a whole.[21]

10.3.2 Sub-regional locations

Plymouth

Principal roads

The trunk road network in Plymouth comprises the A38 which aligns east to west and the A386 which aligns north to south and branches from the A38.[132]

Estimated traffic flows for all vehicle types is 1406 million vehicle kms.[133] 35.45% of Plymouth residents think that over the past three years that the level of traffic congestion has got better or stayed the same. [134]

Average distance travelled to fixed place of work 13.83km.[135] Plymouth is a highly self-contained community with about 80% of people living and working within the city boundary and a relatively high level of public transport usage.[136]

Principal rail lines

The principal railway passing through Plymouth is the Exeter - Penzance line. The main stop is Plymouth Station close to the city centre. Other stations are mainly clustered to the west of the city. [22]

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[131] http://www.drdni.gov.uk/index/statistics/stats-%20catagories/ni_transport_statistics.htm
[132] http://www.plymouth.gov.uk/homepage/transportandstreets/transportplanning/proltp/proltpfacts.htm
[133] http://www.areaprofiles.audit-commission.gov.uk/(bcshuirfoqzyvyycm55fqczn)/DataProfile.aspx?entity=0
[134] The Draft Regional Spatial Strategy for the South West 2006 -2026 (pg 90) http://www.southwest-ra.gov.uk/nqcontent.cfm?a_id=836
[135] http://www.neighbourhood.statistics.gov.uk/dissemination/LeadTableView.do?a=3&b=276837&c=plymouth&d=13&g=401185&i=1001x1003x1006&k=travel+to+work&m=0&r=1&s=1245239859648&enc=1&domainId=15&dsFamilyId=283
[136] http://www.southwest-ra.gov.uk/nqcontent.cfm?a_id=836

Principal air ports

Plymouth City Airport is 5km from the city centre. The airport has both military and civilian applications. [22]

Principal ferry ports

Plymouth has good passenger and fright marine port services. Millbay operates regular international passenger services to Roscoff in northern France and Santander in northern Spain. Almost 2.5 million tonnes of marine freight passes through Plymouth each year.[137]

Fife

Principal roads

The trunk road network in Fife comprises the M90 and A90 which align north to south, and the A985 which aligns east to west along the firth of forth. The vast majority of freight transported in Fife is over short distances by road with an average journey distance of 84km.[138]

In 2007/08, 10% of driver journeys were delayed due to traffic congestion. Significant areas of congestion are clustered around Dunfermline Town and Rosyth, mainly associated with traffic over the Forth Bridge.[139]

Principal rail lines

North of Scotland rail line and East of Scotland rail line. In addition to the main rail routes there is a local 'Fife Circle' route, but while the south and central areas of Fife are well connected by rail, the west of Fife, Levenmouth and the East Neuk area are not.[140]

Principal air ports

Fife has a small airport at Glenrothes (Fife airport). Good transport links are also available to airports located at Edinburgh and Glasgow.

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[137] http://www.plymouth.gov.uk/landingstagesandslipways
[138] http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1
[139] http://www.sns.gov.uk
[140] http://www.audit-scotland.gov.uk/docs/local/2009/bv_090312_fife_em.pdf

Principal ferry ports

Fife has 13 harbours and piers. The Port of Rosyth is the base for daily ferry sailing to Zeebrugge and is also visited by a number of cruise ships each year.[141]

10.4 Existing problems

10.4.1 National

UK

Changes in the UK's rural/urban demographic have resulted in greater traffic volumes around certain urban hubs than those links were originally designed for. Congestion in towns and cities, and on some parts of the strategic road network, has become an ever increasing issue of importance. Currently there are areas of the UK's transport network which are stretched beyond their capacity at peak times of the day[142]. This is particularly true where routes are placed under a number of demands from different transport users (e.g. freight traffic, commuters, etc). There are a number of key hotspots where congestion occurs which can have knock on effects on all types of transport (particularly on strategic routes and the south east). Ultimately transport problems can have a knock on effect on economic performance[143].

The transport of radiological materials by road and rail in the UK is controlled by the Nuclear Installations Inspectorate and the Department for Transport and has an excellent safety record. Nevertheless, any transport of such materials off-site carries a remote risk of accidental damage.

[141] http://www.fife.gov.uk/news/index.cfm?fuseaction=feature.display&objectid=EDFE41B3-E7FE-C7EA-05E36A05EA6F61FE
[142] Department for Transport (2006) The Eddington Transport Study (Section 2). Available online at: http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/
[143] Department for Transport (2006) The Eddington Transport Study (Section 2). Available online at: http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/

10.4.2 Sub-regional locations

Plymouth

Road traffic delays are associated with peak time usage of the A38 Trunk Road. Delays at the A38's city junction's causes delays across the road network, notably in the North and East of Plymouth.[144] There is potential capacity in the rail freight network; although this would require investment to realise.

There are plans to expand the airport with new terminal facilities and a longer runway. This may lead to problems with noise especially given that 7000 homes in Plymouth are already affected by noise from the airport.[145]

Fife

Overall in Fife, traffic and congestion are on the rise, while public transport usage is decreasing.[146]

32.8 % of roads needed maintenance (red and amber classification) in 2008.[147]

10.5 Likely evolution of the baseline

10.5.1 National

The current trend in transport infrastructure is generally towards increased transport journeys. Since 1980, road traffic in Great Britain has grown by 85%; rail travel has increased by nearly 70%; and freight tonne kilometres moved in the UK has increased by 40%. Bus travel has increased over the last eight years (having fallen between 1980 and the mid 1990s); however walking and cycling for travel purposes have both declined significantly over the period 1996 - 2007.[148]

Freight moved (tonne-kilometres) increased roughly in line with economic growth (Gross Domestic Product) until 1998. Since then freight moved has remained stable while GDP has increased by 28%.[149]

According to the Eddington Transport Study (2006) without action, 'travel demand is forecast to grow strongly across all modes under a range of possible scenarios. Existing pressures will widen in their

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[144] http://www.plymouth.gov.uk/homepage/transportandstreets/transportplanning/ltp2006-2011.htm
[145] Plymouth City Council LTP 2011 to 2026 Transport Facts and Figures
http://www.plymouth.gov.uk/homepage/transportandstreets/transportplanning/proltp/proltpfacts.htm
[146] Fife Council, State of the Environment Report, 2007,
http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1
[147] Scottish National Statistics, http://www.sns.gov.uk
[148] http://www.dft.gov.uk/adobepdf/162469/221412/190425/220778/trends2009.pdf
[149] http://www.defra.gov.uk/sustainable/government/progress/documents/SDIYP2009_a9.pdf

geographical impact and their intensity, concentrated on urban areas, around international gateways and on some sections of the inter-urban networks.' The report summaries, according to modelling, that without action there will be a dramatic increase in congestion (up to a 37% increase in congestion) with a greater number of roads experiencing congestion. Inter-urban rail services are due to be well beyond capacity by 2025 on city approaches with the number of passengers standing increasing. The demand for flights is due to more than double by 2030 which will impact the existing airports operating in the UK. The demands for shipping is also due to outgrow capacity (by 2020).[150]

Improvements to the rail network are helping to alleviate congestion on road networks.[151]

The Department for Transport (DfT) targets include to:[152]

- maximise the overall competitiveness and productivity of the national economy, so as to achieve a sustained high level of GDP growth;
- reduce transport's emissions of CO2 and other greenhouse gases, with the desired outcome of avoiding dangerous climate change;
- contribute to better health and longer life expectancy through reducing the risk of death, injury or illness arising from transport,
- promoting travel modes that are beneficial to health;
- improve quality of life for transport users and non-transport users, including through a healthy natural environment, with the desired outcome of improved well-being for all;
- promote greater equality of transport opportunity for all citizens, with the desired outcome of achieving a fairer society; and
- Reduce the number of people killed or seriously injured in Great Britain in road accidents by 40 per cent and the number of children killed or seriously injured by 50 per cent, by 2010 compared with the average for 1994-98, tackling the significantly higher incidence in disadvantaged communities.[153]

England

In 2009, almost 86% of traffic in Great Britain was in England. Traffic is not evenly spread throughout the country;17% of the total traffic in Great Britain is within the South East of England, while only 4% was in

[150] Eddington Transport Study (2006) http://www.dft.gov.uk/adobepdf/187604/206711/executivesummary.pdf
[151] http://www.networkrail.co.uk/aspx/1530.aspx
[152] DfT, Towards a Sustainable Transport System (TaSTS): Supporting Economic Growth in a Low Carbon World, http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/about/strategy/transportstrategy/tasts/
[153] DfT, The Future of Transport White Paper – A Network for 2030, http://www.thepep.org/ClearingHouse/docfiles/The.Future.of.Transport.pdf

the North East of England. [154] Regions within England, excluding London, have seen an increase in overall traffic by 6-11% in 2009 compared to 1999 baseline. However, London has experienced a decrease in overall traffic during the same period by 2%. The average traffic speed over the whole English road network rose from 55.3 mph in 2006 to 55.9 mph in 2008, an increase of 0.6 per cent. Over 18 per cent of total vehicle delay on the inter-urban road network in England in the year ending March 2010 was experienced on the M25.[154]

Forecasts conducted by the Department for Transport predict that compared to 2003 baseline traffic will increase by 7% in 2015, 25% in 2025 and 43% in 2035. Congestion, in terms of lost time per km, again compared to 2003, is expected to increase by 6% in 2015, 27% in 2025 and 54% in 2035.[155]

There was a small decrease in the overall condition of classified roads between 2006/07 and 2007/08. This decrease comes from a deterioration in the condition of all types of roads.[156]

Department for Transport have a target to increase the use of public transport (bus and light rail) by 2010 by more than 12 per cent in England compared with 2000 levels, with growth in every region.[157]

Scotland

On average, Scots travelled 7,056 miles per person per year within Great Britain in the two-year period 2007/2008. There has been a large rise in the distance travelled, with most of the increase being due to travel by car. Over about 20 years, the average distance travelled per person per year increased by 2,404 miles, of which 2,020 were by car. Other National Travel Statistics results for 2007/2008 include average distances travelled per Scottish resident per year of 478 miles by local bus as the main mode for the journey, 541 miles by surface rail, 171 miles by foot, 52 miles by taxi and 30 miles by bicycle.[158]

The Scottish Household Survey shows that the percentage of people travelling by car/van has decreased from 68% to 66% with both the number of driver and passenger journeys showing falls in 2008.

The total number of motor vehicles licensed in Scotland was over 2.7 million at the end of 2008. It has increased steadily over the years, with rises of 30% since 1998, 26% since 1999 and 23% since 2000. However, there were fewer vehicles per 100 population in Scotland (52) than in Great Britain (58) in 2008.

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[154] Dft Road Statistics (2009) http://www.dft.gov.uk/adobepdf/162469/221412/221546/226956/261695/roadstats09tsc.pdf
[155] DfT Road Transport Forecasts (2009) http://www.dft.gov.uk/pgr/economics/ntm/forecasts2009/pdf/forecasts2009.pdf
[156] DfT Transport Trends (2009) http://www.dft.gov.uk/pgr/statistics/datatablespublications/trends/current/
[157] DfT, The Future of Transport White Paper – A Network for 2030, http://www.thepep.org/ClearingHouse/docfiles/The.Future.of.Transport.pdf
[158] http://www.scotland.gov.uk/Resource/Doc/933/0100420.pdf

Traffic volume on Scotland's roads has tended to increase steadily - an overall increase of 18% since 1996, the slight dip in 2000 was due to the fuel price protests. The volume of traffic on Motorways has grown by 46% since 1996, in part due to the expansion of the Motorway network.

Wales

All commentators suggest that transport demand is likely to continue to rise with a continued rise in personal mobility. For example, rail passenger kilometres travelled are projected to increase by 33% between 2000 and 2010, road traffic is expected to increase by 31% between 2003 and 2025 and aviation demand is expected to more than double by 2030. The average distance people travel each year in Wales is continuing to grow at a considerable rate. Stockholm Environment Institute predict that the land transport footprint per capita will increase by 6% 2020 or 12% if air travel is included. There is expected to be a continued high dependence on fossil fuels, with only gradual reduction of road emissions via clean electricity and hydrogen fuel cells, bio-fuels or diesel/petroleum hybrids. Aviation kerosene can be made from biomass.[159]

It is estimated that the volume of motor vehicle traffic on all roads in Wales in 2008 was similar to that in 2007. The volume of traffic has, however, grown by almost 14% since 1999. Traffic on motorways accounted for 12% of all road traffic during 2008[160]. During 2008, vehicle insurance offences accounted for almost one-quarter (24%) of all motoring offences proceedings at magistrates' courts[161]. 3% of motorways and 5.8% of trunk roads require close monitoring of their structural condition in 2009, a small reduction on 2008. 4% of local authority principal roads and 8% of non principal/classified roads were in need of further investigation of their structural condition in 2008/09.[162]

Northern Ireland

Over the time period 2007-2009, each person in Northern Ireland travelled on average 6,002 miles per year (approximately 16 miles travelled per day), similar to 2006-2008 (6,033 miles). On average, there were 914 journeys made per person per year over the period 2007-2009 (approximately three journeys per day). There was no real difference when compared to 2006-2008 (926 journeys per person per year). The average journey length for the period 2007-2009 was 6.6 miles, similar to the journey length for 2006-2008 (6.5 miles). During 2007-2009, the longest journey length was for train journeys, averaging 20.6 miles. In contrast, the shortest journeys were walks which were 0.8 miles on average.

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[159] http://www.assemblywales.org/bus-home/bus-committees/bus-committees-third1/bus-committees-third-sc-home/bus-committees-third-sc-agendas/sc_3_-02-09_p2_appendix_2_-_evidence_from_wlga.pdf?langoption=3&ttl=SC(3)-02-09%20%3A%20Paper%202%20%3A%20Appendix%202%20%3A%20Carbon%20Reduction%20Via%20Planning%20%3A%20Evidence%20from%20WLGA%20(pdf%2C%20312kb)
[160] Welsh Transport Statistics Personal Travel Chapter 6, http://wales.gov.uk/docs/statistics/2009/091027wts2009ch6ency.pdf
[161] Welsh Transport Statistics Motoring offences Chapter 5, http://wales.gov.uk/docs/statistics/2010/100701wts2009ch5ency.pdf
[162] Welsh Transport Statistics Road conditions, http://wales.gov.uk/topics/statistics/headlines/trans2009/hdw200912102/?lang=en

The number of road deaths occurring as a result of reported road traffic collisions increased by 7% from 107 in 2008 to 115 in 2009.[163]

During 2009-10, there were 10 million rail passenger journeys made, a decrease of 2% from 2008-09.

In 2009, Belfast International Airport was the 13th busiest commercial airport in the UK with 4.5 million terminal passengers. This accounted for 2% of all UK terminal passengers. George Best Belfast City airport was the 16th busiest UK commercial airport with 2.6 million terminal passengers, 1% of all UK terminal passengers.

10.5.2 Sub-regional locations

Plymouth

Trends in bus use in Plymouth is relatively static, although there is some fluctuation. Access to local services is showing an increasing trend from 35.45% of people surveyed in 2003/04 reporting that ease of accessing local services had got better or stayed the same to 59% in 2006. However, there appears to be a declining trend in public perceptions of public transport, with 60% of people surveyed in 2006 Plymouth reporting that public transport had got better or stayed the same compared to 75.89% in 2003/04.[164]

The trend in traffic contention is slightly negative with 32% of people surveyed in 2006 reporting that traffic congestion had got better or stayed the same compared to 35.45% in 2003/04.[165]

Plymouth City Council has set a target of enabling 60% of journeys within the City to be undertaken by foot, bicycle or by public transport by 2010.[166]

Fife

In Fife, car ownership, use and the distances travelled by cars each year is increasing[167]. There is likely to be a trend of increasing road transport journeys and increased congestion on Fife's roads.[168]

[163] http://www.drdni.gov.uk/ni_transport_statistics_2009-10.pdf

[164] Plymouth's Sustainable Community Strategy 2007-2020, http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm

[165] Plymouth's Sustainable Community Strategy 2007-2020, http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm

[166] Plymouth City Council, Plymouth City Strategy and Action Plan

[167] Fife Council, Fife Structure Plan SEA 2008, http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/dev-plan/FifeSP/FifeSEAreportFife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1

Fife Council set the following targets:

- a 40% reduction in the number of people killed or seriously injured;
- a 50% reduction in the number of children killed or seriously injured;
- a 10% reduction in the slight injury casualty rate;
- halt the decline in walking;
- maintain the percentage of walk trips to work at 15%; and
- increase cycling to key Public Transport Interchanges by 10% by 2011.[169]

10.6 Assessment objective, guide questions and significance

The objective and guide questions related to cultural heritage that have been used in the assessment of the effects of the SDP are set out in Table 10.1, together with reasons for their selection.

Table 10.1 Approach to assessing the effects of SDP on Transport

Objective/guide question	Reasoning
Objective: To minimise the detrimental impacts of transport on communities and the environment, whilst maximising positive effects	Transport can have effects on a number of SEA objectives including air quality, climate change, biodiversity, population and human health.
Will the SDP proposals affect the number and frequency of heavy, oversized, radioactive and/ or hazardous loads being transported off-site, particularly through sensitive areas (e.g. population centres, historic areas and vulnerable ecosystems?)	Vehicles used to transport heavy loads, especially heavy good vehicles (HGV) have the potential to negatively affect objectives such human health, cultural heritage and biodiversity through increased noise/vibrations and air emissions. The transport of radiological materials by road and rail in the UK is controlled by the Nuclear Installations Inspectorate and the Department for Transport and has an excellent safety record. Nevertheless, any transport of such materials off-site carries a remote risk of accidental damage.
Will the SDP proposals increase or decrease traffic congestion around SDP sites?	In many areas of the UK greater traffic volumes and congestion is becoming an increasingly important issue. Transport related to construction of dismantling and storage sites and to a lesser extent during the operation/decommissioning of the project have the potential to significantly increase local traffic congestion. Within government strategies there are objectives to seek to decrease congestion and 'seek to improve journey times and connections' (*Scottish National Transport Strategy*) and 'deliver reliable and efficient transport networks' (*Delivering a sustainable transport system*)

[168] Fife Council, Fife Structure Plan SEA 2008, http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/dev-plan/FifeSP/FifeSEAreport
[169] Fife Council, Local Transport Strategy for Fife 2006-2026

Objective/guide question	Reasoning
Will the SDP proposals increase or decrease the risk of traffic accidents around SDP sites?	Need to meet requirements on road traffic from The Road Safety Act (2006). Government strategies such as *Delivering a sustainable transport system* include objectives on contributing to better health and safety on the roads and decreasing traffic accidents.

Table 10.2 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the transport objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 10.2 Approach to determining the significance of effects on transport

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option will result in a significant decrease in total HGV movements from/to site. • Option will significantly reduce traffic congestion in the vicinity of SDP sites. • Option will significantly reduce the risk of road traffic accidents in the vicinity of SDP sites. • Option will incorporate enhancements to the existing local transport network (e.g. junction capacity improvements). • Option will increase accessibility to public transport.
+	Positive	• Option will result in a minor reduction in total HGV movements from/to site, • Option will reduce traffic congestion in the vicinity of SDP sites. • Option will reduce the risk of road traffic accidents in the vicinity of SDP sites. • Option will incorporate enhancements to the existing local transport network (e.g. junction capacity improvements).
0	No (neutral effects)	• Option has no observable effects on existing local transport networks or on the incidence and risk of road traffic accidents in the vicinity of SDP sites.
-	Negative	• Option will increase the number and frequency of HGV movements to/from the site. • Option will result in a minor increase in traffic congestion in the vicinity of SDP sites resulting in driver delay, loss of pedestrian/cyclist amenity and severance to pedestrians/cyclists. • Option will increase the risk of road traffic accidents in the vicinity of SDP sites.
--	Significant negative	• Option will result in a significant and sustained increase in the number and frequency of HGV movements, particularly in sensitive areas (e.g. population centres, historic areas and vulnerable ecosystems). • Option will result in a significant and sustained increase in traffic congestion in the vicinity of SDP sites resulting in driver delay, loss of pedestrian/cyclist amenity and severance to pedestrians/cyclists. • Option will significantly increase the risk of road traffic accidents in the vicinity of SDP sites.

Effect	Description	Illustrative Guidance
?	Uncertain	• From the level of information available the effects the impact that the option would have on this objective is uncertain.

10.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the transport objective. **Box 10.1** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 10.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 10.4** below.

Table 10.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than 'greenfield' sites, although it is recognised that 'brownfield' land can be important for

Category	Assumption Description
	conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m^2. Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2. As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average). • It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine

Category	Assumption Description
	• It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since breaking a cleared submarine is little different to breaking a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be transported from the initial dismantling facility to the interim storage facility by sea, rail or

Category	Assumption Description
	road. • **Fully-packaged ILW -** It is assumed that each 3m^3 container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Table 10.3** are considered in-turn below.

Stage I: Designing & Developing the Initial Submarine Dismantling Facility

Material Assets (Transport)

Option 1: Develop a Greenfield Site for Submarine Dismantling

Assessment of Effects:

The construction of dismantling and size reduction facilities and any ancillary infrastructure/facilities on a coastal greenfield site could result in a significant increase in transport movements on the local road network (e.g. lower order, B and C roads) associated with construction staff, HGVs, a range of heavy plant construction vehicles, concrete tankers and deliveries throughout the construction phase.

Effects that could be considered as potentially significant on the road network include congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the sites' location, the exact route(s) used, the existing road users and the quality of the existing transport network. Environmental effects associated with increases in vehicle movements could include effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks.

Potentially, the development may need to include transport infrastructure (such as road or rail spur) or enhancements to the existing transport network to accommodate the demands of construction traffic. However, given the coastal location, it would be expected that much of the movement of construction material would be by sea to minimise disruption to users of existing transport networks. If such improvements or additions to the existing transport network were not deemed appropriate, the potentially significant negative effects described above could occur.

Due to the potential for specific supply chains to be required for the development of the facilities, it is likely that extended transport journey distances will be required to support the material requirements.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities and infrastructure (e.g. roads, car parking, security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale of construction would be reduced under RC/RPV storage options in the short term relative to PW storage (which would require construction of all dismantling and size reduction facilities 'up front'), it is expected that there would also be a reduction in associated traffic movements and, consequently, disturbance to local transport networks (and users) as well as environmental effects (e.g. effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks). However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep levels of disturbance and environmental effects below threshold levels where they may have a negative effect on this objective.

Proposed Mitigation / Enhancements Measures:

- To minimise the movement of construction materials, locally sourced construction materials should be used where practicable and, where possible, any construction waste should be retained and used on site.
- To reduce traffic effects during the construction phase of the development, the following mitigation should be implemented:
    - Tender specifications should provide information on traffic management requirements and request information from contractors on how measures would be implemented to mitigate traffic and transport effects.
    - A road safety audit of the site access design should be undertaken prior to construction to ensure that the access is an appropriate

Stage I: Designing & Developing the Initial Submarine Dismantling Facility Material Assets (Transport)	
design, capable of accommodating construction and operational traffic, and would not compromise safety on the public highway. o A Traffic Management Plan (TMP) should be prepared and adopted. The TMP is likely to include details on car parking, temporary road signage and construction traffic routing and timing. Similarly, a Green Travel Plan should be developed and implemented, outlining measures to reduce private vehicle use such as the promotion of car sharing, the provision of services for construction workers to the site (i.e. buses) and the provision of public transport passes where the site is accessible by public transport Traffic movements (particularly HGVs) should be limited along certain routes or at certain times of the day to minimise the effects of congestion and nuisance or intrusion on any nearby residents. o Routing strategies should be implemented for construction material transport in order to avoid, as far as possible, sensitive receptors and congestion effects. Deliveries should be co-ordinated by a logistics manager to prevent queuing of vehicles. Arrivals of materials should also be scheduled to outside of peak hours to minimise any disruption to the existing highway network. o A regularly serviced modern lorry fleet should be used for the collection of waste, transportation of plant and equipment. o The immediate area external to the site, including the site entrances and adjacent road/footpath, should be subject to regular sweeping and washing using a combination of manual and mechanical means. Lorries should pass through wheel washing installations prior to departure in order to minimise dirt on the roads. • Contributions could be made towards improving the road network and public rights of way where appropriate.	
Summary: Option 1 has been assessed as having a potentially significant negative effect in relation to this objective due to the effects of a significant increase in transport movements on the local road network. This reflects the scale of likely development, the demand for construction materials and the assumptions that this material will be transported (in part) by road. Environmental effects associated with increases in vehicle movements could include effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks. Further to this it is also therefore expected that it is likely to necessitate improvements to local transport networks due to the increase in transport movements and the rural locality of the proposed site. For RC and RPV storage options construction of the size reduction facility would be delayed, reducing associated traffic movements and, consequently, disturbance to local transport networks (and users) as well as environmental effects. However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep levels of disturbance and environmental effects below threshold levels where they may have a negative effect on this objective.	--
Option 2: Develop Brownfield Site for Submarine Dismantling	
Assessment of Effects: The construction of dismantling/size reduction facilities and ancillary infrastructure on a coastal brownfield site could result in a increase in transport movements on the local road network associated with construction staff, HGVs, a range of heavy plant construction vehicles, concrete tankers and deliveries throughout the construction phase however due to the scale of construction anticipated on a brownfield site, the volume of construction materials will be less than that identified within Option 1, due to previously developed infrastructure and hardstandings. Effects that could be considered as potentially significant on the road network include congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the sites' location, the exact route(s) used, the existing road users and the quality of the existing transport network. Due to the development of and the previous uses of the proposed site it is generally expected that the traffic infrastructure will have a greater capacity to that identified within Option 1 and be better connected with greater resilience in order to cope with increases in traffic thus reducing the severity of the negative effects as identified within that of Option 1.	

Stage I: Designing & Developing the Initial Submarine Dismantling Facility Material Assets (Transport)	
Environmental effects associated with increases in vehicle movements could include effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks. Potentially, the development may need to include transport infrastructure (such as road or rail spur) or enhancements to the existing transport network to accommodate the demands of construction traffic although some of this if not all is expected to be existing from previous site uses. However, given the coastal location, it would be expected that much of the movement of construction material may be by sea to minimise disruption to users of existing transport networks, however under this option there is a potential for such a reduction in materials requirements that movement of material by sea may not be viable thus increasing the number of HGV movements on the local road infrastructure. Due to the potential for specific supply chains to be required for the development of a dismantling facility, it is likely that extended transport journey distances will be required to support the material requirements. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on a brownfield site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities (e.g. security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage. As the scale of construction would be reduced under RC/RPV storage options in the short term relative to Package Waste storage (which would require construction of all dismantling and size reduction facilities 'up front'), it is expected that there would also be a reduction in associated traffic movements and, consequently, disturbance to local transport networks (and users) as well as environmental effects (e.g. effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks). However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep levels of disturbance and environmental effects below threshold levels where they may have a negative effect on this objective. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a negative effect in relation to this objective. This is due to the assumption that the scale of construction required at the brownfield site will be substantially less than Option 1 and that the associated transport movements required to support development of SDP facilities will be commensurately reduced. However, as the quantities of construction material are less, the movement of these materials is more likely to be by road (rather than rail or sea). It is also assumed that a brownfield site will be better serviced by the existing transport network and so can more readily accommodate the movement of construction materials. As a consequence, the effects of the increase in traffic movements on sensitive receptors whilst negative, are considered less likely to be significant. For RC and RPV storage options construction of the size reduction facility would be delayed, reducing associated traffic movements and, consequently, disturbance to local transport networks (and users) as well as environmental effects. However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep levels of disturbance and environmental effects below threshold levels where they may have a negative effect on this objective.	-

Stage I: Designing & Developing the Initial Submarine Dismantling Facility Material Assets (Transport)	
Option 3: Develop Licensed/Authorised Site for Submarine Dismantling	
Assessment of Effects: The construction of SDP facilities on an existing nuclear Licensed/Authorised site could result in a increase in transport movements on the local road network associated with construction staff, HGVs, a range of heavy plant construction vehicles, concrete tankers and deliveries throughout the construction phase however, due to the scale of construction anticipated on an existing licensed authorised site the volume of construction materials will be less than that identified within Option 1, due to existing docks, dockside developments, transport infrastructure and hardstandings. Effects that could be considered as potentially significant on the road network include congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the sites' location, the exact route(s) used, the existing road users and the quality of the existing transport network. Due to the development of and the existing uses of the proposed site it is generally expected that the traffic infrastructure will have a greater capacity to that identified within Option 1, however in light of the fact that the site is an existing licensed site with ongoing activities the ability for the existing road infrastructure to absorb additional traffic movements albeit less than that identified within Option 1 could create a significant negative effect. Environmental effects associated with increases in vehicle movements could include effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks. Potentially, the development may need to include transport infrastructure (such as road or rail spur) or enhancements to the existing transport network to accommodate the demands of construction traffic although some of this if not all is expected to be existing from previous site uses. However, given the coastal location, it would be expected that much of the movement of construction material may be by sea to minimise disruption to users of existing transport networks, however under this option there is a potential for such a reduction in materials requirements that movement of material by sea may not be viable thus increasing the number of HGV movements on the local road infrastructure. Due to the potential for specific supply chains to be required for the development of a dismantling facility, it is likely that extended transport journey distances will be required to support the material requirements. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on an existing Licesned/Authorised site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities. A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage. As the scale of construction would be reduced under RC/RPV storage options in the short term relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities 'up front'), it is expected that there would also be a reduction in associated traffic movements and, consequently, disturbance to local transport networks (and users) as well as environmental effects (e.g. effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks). However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep levels of disturbance and environmental effects below threshold levels where they may have a negative effect on this objective. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective. This is due to the assumption that the scale	-

Stage I: Designing & Developing the Initial Submarine Dismantling Facility Material Assets (Transport)	
of construction required at the existing Licensed/Authorised site will be substantially less than Option 1 and that the associated transport movements required to support development will be commensurately reduced. However, as the quantities of construction material are less, the movement of these materials is more likely to be by road (rather than rail or sea). It is also assumed that the existing transport network connecting the licensed facility is less likely to have the potential for spare capacity that could be available in Option 2 and as a consequence, whilst the scale of the potential effects is reduced, there are still likely to be negative effects on sensitive receptors and other transport users. For RC and RPV storage options construction of the size reduction facility would be delayed, reducing associated traffic movements and, consequently, disturbance to local transport networks (and users) as well as environmental effects. However, under RC/RPV storage options further effects would be felt in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep levels of disturbance and environmental effects below threshold levels where they may have a negative effect on this objective.	

Stage II: Designing and Developing the Interim ILW Storage Facilities

Materials Assets (Transport)

Option 1: Develop Greenfield Site for ILW Storage

Assessment of Effects:

Given the generic nature of the construction proposals for the interim storage facility, it is assumed that the potential effects associated with this objective will be largely similar as for Stage 1 (construction of dismantling and size reduction facilities).

The construction of a storage facility and ancillary infrastructure on a coastal greenfield site could result in a significant increase in transport movements on the local road network (e.g. lower order, B and C roads) associated with construction staff, HGVs, a range of heavy plant construction vehicles, concrete tankers and deliveries throughout the construction phase.

Effects that could be considered as potentially significant on the road network include congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the sites' location, the exact route(s) used, the existing road users and the quality of the existing transport network. Environmental effects associated with increases in vehicle movements could include effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks.

Potentially, the development may need to include transport infrastructure (such as road or rail spur) or enhancements to the existing transport network to accommodate the demands of construction traffic. However, given the possibility of facilities being coastally located, it is expected that much of the movement of construction material would be by sea to minimise disruption to users of existing transport networks. If such improvements or additions to the existing transport network were not deemed appropriate, the potentially significant negative effects described above could occur.

Due to the potential for specific supply chains to be required for the development of a storage facility, it is likely that extended transport journey distances will be required to support the material requirements.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area, as well reception, admin, dispatching, inspection and maintenance areas. Additional infrastructure will also be required under this land use option such as docking facilities, security (standoff and centre), car parking, roads and internal rail line although the total area required for these additional features is unknown.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities, car parking and roads will also be required under this land use option. Should RPVs be transported by sea (which is the most likely option) then docking facilities would also be required.
- Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Additional infrastructure including security (standoff and centre), car parking, roads and an external rail line (if required), may also be required under this land use option. As packaged waste is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.

The potential significance of effects associated with construction is most likely to be greatest for the development of a RC storage facility given the increased scale of construction activity and, therefore, additional HGV movements associated with materials transportation and removal of spoil from building construction from the storage facility which may cause disruption to local transport networks (and users) and adverse environmental effects. However, under this technical option (and for RPV storage), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects).

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities on a greenfield site).

Stage II: Designing and Developing the Interim ILW Storage Facilities Materials Assets (Transport)	
Summary: Option 1 has been assessed as having a significant negative effect in relation to this objective due to the significant increase in transport movements on the local road network. This reflects the scale of likely development, the demand for construction materials and the assumptions that this material will be transported (in part) by road. Environmental effects associated with increases in vehicle movements could include effects on air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks. It is also expected that the proposals would necessitate improvements to local transport networks due to the increase in transport movements and the rural locality of the proposed site. The potential significance of effects associated with construction is most likely to be greatest for the development of a RC storage facility given the increased scale of construction activity. However, under this technical option (and for RPV storage), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects).	--

Option 2: Develop a Brownfield Site for ILW Storage

Assessment of Effects:

The construction of a storage facility on a coastal brownfield site could result in an increase in transport movements on the local road network associated with construction staff, HGVs, a range of heavy plant construction vehicles, concrete tankers and deliveries throughout the construction phase. However, it is expected that the scale of construction on a brownfield site will be less than for Option 1 as it is assumed that most of the infrastructure and ancillary facilities will already be present.

The potential effects will be similar in range to those described for Option 1, namely, congestion, severance to pedestrians/cyclists, driver delay and increased number and severity of accidents. Environmental effects associated with increases in vehicle movements could include effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks.

It is expected that the smaller scale of construction activity will result in a smaller scale of associated effects on transport.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area, as well as reception, admin, dispatching, inspection and maintenance areas. Security facilities including a security centre and standoff area will also be required, as well as an internal rail line. However, it is assumed that docking facilities, car parking and roads will already be present.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and docking facilities (should RPVs be transported by sea) will already be present.
- Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and external rail line (if required) will already be present. As packaged waste is likely to be transported by either road or rail, it is assumed that there will be no need for a docking facility.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 1, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar.

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).

Stage II: Designing and Developing the Interim ILW Storage Facilities Materials Assets (Transport)	
Summary: Option 2 has been assessed as having a negative effect in relation to this objective. This is due to the assumption that the scale of construction required at the brownfield site will be substantially less than Option 1 and that the associated transport movements required to support development of a storage facility will be commensurately reduced. It is also assumed that a brownfield site will be better serviced by the existing transport network and so can more readily accommodate the movement of construction materials. As a consequence, the effects of the increase in traffic movements on sensitive receptors whilst negative, are considered less likely to be significant. The potential significance of effects associated with construction is most likely to be greatest for the development of a RC storage facility given the increased scale of construction activity. However, under this technical option (and for RPV storage), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects).	-

Option 3: Develop a Licensed/Authorised Site for ILW Storage

Assessment of Effects:

The construction of a storage facility and ancillary infrastructure on an existing nuclear Licensed/Authorised site could result in an increase in transport movements on the local road network associated with construction staff, HGVs, a range of heavy plant construction vehicles, concrete tankers and deliveries throughout the construction phase. However, the scale of construction anticipated on an existing Licensed/Authorised site is expected to be less than for Option 1 and similar (or less than) Option 2, as it is assumed that most of the necessary infrastructure and ancillary facilities will already be present.

The potential effects will be similar in range to those described for Option 1, namely, congestion, severance to pedestrians/cyclists, driver delay and increased number and severity of accidents. Environmental effects associated with increases in vehicle movements could include effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks.

It is expected that the smaller scale of construction activity will result in a smaller scale of associated effect on transport.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well reception, admin, dispatching, inspection and maintenance areas. It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present.
- RPV storage will require a facility with an area in the region of 801m^2 (including total vault area and reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present.
- Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including total vault area as well as reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as security (standoff and centre), car parking, roads and external rail line (if required) are assumed to be already present.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar.

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).

Stage II: Designing and Developing the Interim ILW Storage Facilities **Materials Assets (Transport)**	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective. This is due to the assumption that the scale of construction required at the existing licensed site will be substantially less than Option 1 and that the associated transport movements required to support development of a storage facility will be commensurately reduced. However, as the quantities of construction material are less, and the movement of these materials is more likely to be by road (rather than rail or sea). It is also assumed that the existing transport network connecting the licensed facility is less likely to have the potential for spare capacity that could be available in Option 2 and as a consequence, whilst the scale of the potential effects is reduced, there are still likely to be negative effects on sensitive receptors and other transport users. The potential significance of effects associated with construction is most likely to be greatest for the development of a RC storage facility given the increased scale of construction activity. However, under this technical option (and for RPV storage), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects).	**-**

Stage III: Docking the Submarines and Processing the Reactor Compartments Materials Assets (Transport)	
Option 1: Dock Submarine & Cut-Out Reactor Compartment	
Assessment of Effects: It is assumed that movement of the submarines from their present location to the dismantling facility will occur by one of 3 different options; wet tow, dry tow or standard cargo vessel. This transportation has potential to affect biodiversity, air quality and climate change/energy use and these have been considered in more detail under the relevant topic areas. Risks of accidental discharges are considered to be remote as submarines will have undergone preparation for safe transportation. In addition, submarine movement could impact on environmental receptors through submarine sinking from a collision event, submarine grounding or a major fire event. Although, if these events were to occur the impact on environmental receptors could be negative, the likelihood of any occurring is very small. In order to determine any scale difference in effects from transport methods it will be important to further understand distance travelled and difference in environmental impacts for each of the transportation options. The level of these effects will also depend upon the total distance to be travelled between location of laid up submarine to the dismantling facility, which at this point is uncertain. Given that it is expected there will be only one submarine movement to the dismantling facility per annum, even accounting for the additional vessels that will accompany the submarine for transportation and security purposes, it is assumed that any adverse effects on other seaway infrastructure will be within a very short time frame and therefore insignificant. The movement of plant equipment, materials and waste to and from the site during operations is likely to increase the number of HGV movements in the local area. This could have negative effects on the road infrastructure such as congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the sites' location, the exact route(s) used, the existing road users and the quality of the existing transport network. Increases in HGV movements may also have effects on air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks (this is considered in more detail under the appropriate topics). However, it is considered that the scale of HGV movements required is unlikely to have a significant impact. Additional to the HGV movements associated with operation, the movement of staff is likely to further increase the overall number of vehicle movements in the local area and the associated effects. However, the scale of employees expected is within the order of 20-30 FTE jobs a year for this option at this stage of dismantling, which is considered as unlikely to cause substantial negative effects on the road infrastructure or environment. **Proposed Mitigation / Enhancements Measures:** • Seek to minimise the distance travelled by submarines between lay up and dismantling sites • Consider routing and timing of submarine transportation to avoid protected areas and minimise impacts on sensitive environmental receptors • Conduct an evaluation how the environmental impact differs between each submarine transport option. • Devise and implement a travel plan to encourage staff to use alternatives to single-occupancy car-use. • Measures to decrease the effects of increases in vehicular greenhouse gas emissions should be implemented where possible. • In order to alleviate the potential stress on road infrastructure from increased vehicle movements, where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.	
Summary: Option 1 has been assessed as having a neutral impact on this objective as the scale of increase to vehicle movement in the local area associated with the movement of plant equipment, materials, staff and waste during the processing activities is considered as unlikely to have a negative impact. The transportation of one submarine a year is expected to have minimal and temporary impact on the seaway traffic/infrastructure. The risks of accidental discharges or collision events is considered to be low but if such an event were to	**0**

Stage III: Docking the Submarines and Processing the Reactor Compartments **Materials Assets (Transport)**	
occur it could be significantly negative on this objective.	
Option 2: Dock Submarine & Cut-Out Reactor Pressure Vessel	
Assessment of Effects The effects of transportation of submarine to the dismantling facility will depend upon both the distance travelled and the method of transport chosen. Each of the technical options have the same uncertainties regarding total distances travelled by the submarines and choice of one of three transport options. Given these uncertainties exist across all technical options and that in all cases there will be one submarine movement a year, it is considered that risks of environmental discharge, collision events and total energy use/emissions and their associated effects on seaway infrastructure and environment (including to biodiversity, air quality, climate change, health etc) will be the same across each of the options (see Option 1 for more detail). Under this option, the RPV will be removed from the hull for storage with some LLW arising in the RPV removal process. It is assumed that the transportation of LLW and other wastes would be via road and consequently, there may be associated negative effects on the road infrastructure related to HGV movements. However, it is assumed that the number of LLW and waste movements per annum would be small. Whether such additional vehicle movements are significant will be dependent upon the location of the dismantling facility, HGV routing, timing and frequency and as a consequence, are deemed to be uncertain until the location of a dismantling facility is identified. There may also be an opportunity to transport LLW by rail or, given the coastal location, sea which could reduce these effects. As the number of staff expected for RPV removal and storage is considered to be very similar to RC removal and storage (within the range of 30-60 jobs a year) it is expected that Option 2, similar to Option 1, is unlikely to cause considerable negative effects on road infrastructure or generate disturbance on a level likely to impact local communities or wildlife. **Proposed Mitigation / Enhancements Measures** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a neutral impact on this objective as the scale of increase to vehicle movement in the local area associated with the movement of plant equipment, materials, staff and waste during the processing activities is considered to be minor. Although in the medium term there is expected to be a greater increase in vehicle movements relative to Option 1 due to further processing activities linked to RC dismantling to obtain RPV and the transport of LLW to the National LLW Repository in Cumbria, it is still considered as unlikely to have a negative effect on road infrastructure. The transportation of one submarine a year is expected to have minimal and temporary impact on the seaway traffic/infrastructure. The risks of accidental discharges or collision events are considered to be low but if such an event were to occur it could be significantly negative.	**0**
Option 3: Dock Submarine & Cut-up Packaged Waste	
Assessment of Effects: The effects of transportation of submarine to the dismantling facility will depend upon both the distance travelled and the method of transport chosen. Each of the technical options has the same uncertainties regarding total distances travelled by the submarines and choice of one of three transport options. Given these uncertainties exist for all technical options and the fact that there will be one submarine movement a year in all cases, it is considered that risks of environmental discharge, collision events and total energy use/emissions and their associated effects on seaway infrastructure and environment (including to biodiversity, air quality, climate change, health etc) will be the same across each of the options (see Option 1 for more detail). Option 3 requires the cut out of RPV from the RC, and its subsequent size reduction and segregation into LLW and ILW packaged waste. It is assumed that the transportation of LLW and other wastes would be via road and consequently, there may be associated negative effects on the	

Stage III: Docking the Submarines and Processing the Reactor Compartments Materials Assets (Transport)	
road infrastructure related to HGV movements. However, it is assumed that the number of LLW and waste movements per annum would be minor. The severity of these effects is also dependent upon the location of the dismantling facility, HGV routing and the proximity of existing road infrastructure and as are consequently deemed to be uncertain until the location of a dismantling facility is identified. There may also be an opportunity to transport LLW by rail or, given the coastal location, sea which could reduce these effects. RC/RPV removal and packaging of ILW waste will generate between 50 and 100 employment opportunities per annum over the 27 years of operational activities. As a result there will a greater increase in vehicle movements and an increased risk of negative impact on road infrastructure or other topic areas (biodiversity, air quality, climate change and energy). **Proposed Mitigation / Enhancements Measures** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a neutral impact on this objective as the scale of increase to vehicle movement in the local area associated with the movement of plant equipment, materials, staff and waste during the processing activities is considered to be minor. Although in the medium term there is expected to be a greater increase in vehicle movements relative to option 2 due to further processing activities linked to RPV dismantling and processing of packaged waste, it is still considered as unlikely to have a significant negative effect on road infrastructure. The transportation of one submarine a year is expected to have minimal and temporary impact on the seaway traffic/infrastructure. The risks of accidental discharges or collision events are considered to be low but if such an event were to occur it could be significantly negative.	**0**

Stage IV: Dismantling and Recycling the Residual Submarine Hulls and Processing Wastes Material Assets (Transport)	
All Options	
Assessment of Effects: It is assumed that movement of the submarines from the dismantling facility to the ship recycling facility will occur by one of 3 different options; barge/semi submersible ship, towing or reconnection of the hulls to produce a watertight unit capable of floatation for movement (for the RC option). This transportation has potential to affect biodiversity, air quality and climate change/energy use and these have been considered in more detail under the relevant topic areas. Risks of accidental discharge are considered to be remote, as submarines will have undergone preparation for safe transportation. In addition, submarine movement could impact on environmental receptors through submarine sinking from a collision event, submarine grounding or a major fire event. Although, if these events were to occur the impact on environmental receptors could be negative, the likelihood of any occurring is very small. In order to determine any scale difference in effects from transport methods it will be important to further understand distance travelled and difference in environmental impacts for each of the transportation options. The level of these effects will also depend upon the total distance to be travelled between location of laid up submarine to the dismantling facility, which at this point is uncertain. Given that it is expected there will be only one movement of the submarines from the dismantling facility to the ship-recycling facility per year, it is assumed that any adverse effects on other seaway infrastructure will be within a very short time frame and therefore insignificant. The movement of plant equipment, materials and waste to and from the site during operations may increase the number of HGV movements in the local area (estimated to be in the range of 200 – 300 HGV movements per annum). This could have negative effects on the road infrastructure such as congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the sites' location, the exact route(s) used, the existing road users and the quality of the existing transport network. These increases in HGV movements may also have effects on air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks (this is considered in more detail under the appropriate topics). However, it is considered that the HGV movements will be similar to those already occurring at the ship-recycling facility (from current activities) and therefore there is expected to be no significant change to current HGV movements. The increase to HGV movements at the dismantling facility is considered to be of a scale unlikely to cause any negative effects. There may also be an opportunity to transport these materials by sea. **Proposed Mitigation / Enhancements Measures:** • Seek to minimise the distance travelled by submarines between lay up and dismantling sites. • Consider routing and timing of submarine transportation to avoid protected areas and minimise impacts on sensitive environmental receptors. • Conduct an evaluation of how the environmental impact differs between each submarine transport option. • Measures to decrease the effects of increases in vehicular greenhouse gas emissions should be implemented where possible. • In order to alleviate the potential stress on road infrastructure from increased vehicle movements, where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.	
Summary: This stage has been assessed as having a neutral impact on this objective. At the ship recycling site, vehicle movements are considered to be similar to those experienced from existing activities and therefore unlikely to alter from the baseline situation. Although increases in vehicle movements are expected at the dismantling facility due to movement of staff and waste, it is considered to be of a scale unlikely to affect current road infrastructure. The transportation of a submarine once per year from the dismantling facility to the ship recycling facility is expected to have minimal and temporary impact on the seaway traffic/infrastructure. The risks of accidental discharges or collision events are considered to be low but if such an event were to occur it could be significantly negative on this objective.	**0**

Stage V: Transport RC/RPV/ILW to Interim Storage **Materials Assets (Transport)**	
Option 1: Reactor Compartment Transport and Storage	
Assessment of Effects: The movement of the RC from the dismantling facility to the interim storage facility is expected to be undertaken by sea barge. Nonetheless, as the location of the dismantling facility and the interim storage facility are currently unknown and therefore it is assumed that there is potential for dredging to be required to enable clear access and egress to the docking facilities required at both the dismantling facility site and the storage site under this option to maintain operation. This transportation has potential to affect biodiversity, air quality and climate change/energy use and these have been considered in more detail under the relevant topic areas. Risks of accidental discharges are considered to be remote as RC will have undergone preparation for safe transportation. In addition, RC movement could impact on environmental receptors through sea barge sinking from a collision event, sea barge grounding or a major fire event. Although, if these events were to occur the impact on environmental receptors could be negative, the likelihood of any occurring is very small. In order to determine any scale difference in effects from transport methods it will be important to further understand distance travelled and difference in environmental impacts for each of the transportation options. The level of these effects will also depend upon the total distance to be travelled between location of the dismantling facility and the interim storage facility, which at this point is uncertain. Given that it is expected there will be only one movement of RC from the dismantling facility to the interim storage facility per year, it is assumed that any adverse effects on other seaway infrastructure will be within a very short time frame and therefore insignificant. As identified previously, RC storage will generate some vehicle movements associated with the transportation of workers employed to undertake maintenance activities at the storage facility and security personnel as well as a limited number of HGV movements which could have a negative impact on the local transport network (and users). However, it is anticipated that the number of staff associated with these activities will be minimal and, consequently, the volume of vehicle movements would be low although movements to/from the site will increase during RC unloading and any additional preparatory works prior to storage. It is also assumed that as part of the development of the storage facility, any necessary improvements to existing transport infrastructure will be undertaken (informed by a Transport Assessment and in consultation with the local highways authority) to accommodate additional capacity requirements. **Proposed Mitigation / Enhancements Measures:** • Seek to minimise the distance travelled by RC between dismantling site and interim storage. • Consider routing and timing of RC transportation to avoid protected areas and minimise impacts on sensitive environmental receptors. • Emergency response plan to address any potential unplanned events.	
Summary: It is expected that transport of the RC from the dismantling facility to the interim storage facility and transport movements associated with the storage period will have a neutral effect under this objective as the scale of transportation movements is not considered to be significant to trigger an effect. However due to the location of the dismantling site and the interim storage facility being unknown at this point there is potential for dredging at both sites to accommodate the access and egress of the sea-barge as well as the distance to be travelled being a further uncertainty. Furthermore, there is potential for effects to biodiversity, air quality and climate change/energy dependant on the distance to be travelled and the location of sensitive receptors in relation to the location of both sites.	**0**

Stage V: Transport RC/RPV/ILW to Interim Storage Materials Assets (Transport)
Option 2: Reactor Pressure Vessel Transport and Storage

Assessment of Effects:

The movement of the RPV from the dismantling facility to the interim storage facility is expected to occur by one of 3 different options; sea, road or rail.

If the RPV is transported by sea it is expected that the level of effects will likely be the same as have been identified within Option 1, as the location of the dismantling facility and the interim storage facility are currently unknown and therefore it is assumed that there is potential for dredging to be required to enable clear access and egress to the docking facilities required at both the dismantling facility site and the storage site.

If the RPV was to be transported by road it would be classed as an abnormal (or oversize) load and would require a specialist vehicle, potential with escort and subject to speed restrictions. As a consequence, it will be important to consider the route taken, timings and the time of day the movement will be made to reduce the likelihood of affecting local transportation routes.

If the RPV was to be transported by rail it will be important to consider the journeys to and from the rail transfer facilities, unless a rail connection was available on site at the initial dismantling facility. Considerations would again include the route taken and timings.

This stage of transportation has potential to affect biodiversity, air quality and climate change/energy use and these have been considered in more detail under the relevant topic areas.

Risks of accidental discharges are considered to be remote as the RPV will have undergone preparation for safe transportation and will be contained within the appropriate level of shielding. However, RPV movement could impact on environmental receptors through sea barge sinking, sea barge grounding, train derailment, road incident from a collision event or a major fire event. The irradiated components within the RPV will be predominately solid steels and will not be mobile. As a consequence, any release could only arise where temperatures associated with a vehicle fire were sufficiently high enough to change the physical state of the ILW. If such events were to occur, there is the potential that the impact on environmental receptors could be negative; however, the likelihood of any occurring is very small.

In order to determine any scale difference in effects from transport methods it will be important to further understand distance travelled and difference in environmental impacts for each of the transportation options. The level of these effects will also depend upon the total distance to be travelled between location of the dismantling facility and the interim storage facility, which at this point is uncertain. Given that it is expected there will be only one movement of RPV from the dismantling facility to the interim storage facility per year, it is assumed that any adverse effects on other transportation infrastructure will be within a very short time frame and therefore insignificant.

As identified previously, RPV storage will generate some vehicle movements associated with the transportation of workers employed to undertake maintenance activities at the storage facility and security personnel as well as a limited number of HGV movements which could have a negative impact on the local transport network (and users). However, it is anticipated that the number of staff associated with these activities will be minimal and, consequently, the volume of vehicle movements would be low although movements to/from the site will increase during RPV unloading and any additional preparatory works prior to storage. It is also assumed that as part of the development of the storage facility, any necessary improvements to existing transport infrastructure will be undertaken (informed by a Transport Assessment and in consultation with the local highways authority) to accommodate additional capacity requirements.

Proposed Mitigation / Enhancements Measures:

- Seek to minimise the distance travelled by RPV between dismantling site and interim storage.
- Consider routing and timing of RPV transportation to avoid protected areas and minimise impacts on sensitive environmental receptors.
- Conduct an evaluation of how the environmental impact differs between each transport option.
- In order to alleviate the potential stress on road infrastructure from increased vehicle movements, where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.
- Measures to decrease the effects of increases in vehicular greenhouse gas emissions should be implemented where possible.

Stage V: Transport RC/RPV/ILW to Interim Storage Materials Assets (Transport)	
• Emergency response plan to address any potential unplanned events.	
Summary: It is expected that transport of the RPV from the dismantling facility to the interim storage facility will have a neutral effect under this objective as the scale of transportation movements is not considered to be significant to trigger an effect. However, due to the location of the dismantling site and the interim storage facility being unknown at this point there is potential within transportation by sea, for dredging at both sites to accommodate the access and egress of the sea-barge as well as the distance to be travelled being a further uncertainty. Furthermore, there is potential for effects to biodiversity, air quality and climate change/energy dependant on the distance to be travelled and the location of sensitive receptors in relation to the location of both sites.	**0**

Option 3: Packaged Waste Transport and Storage

Assessment of Effects:

The movement of the packaged waste from the dismantling facility to the interim storage facility is expected to occur by road or rail.

This stage of transportation has potential to affect biodiversity, air quality and climate change/energy use and these have been considered in more detail under the relevant topic areas.

Risks of accidental discharges are considered to be remote as packaged waste will have undergone preparation for safe transportation and will be contained within the packaged waste 3m^3 box with associated overpacks which have been designed for transportation. It is assumed that there will only be two overpacks available for the transportation of the expected eight boxes of packaged waste in each year. Given that anticipated frequency of movements (once every six weeks), the likelihood of transportation of packaged waste from the dismantling facility to the interim storage facility creating additional congestion to the local rail or roads is unlikely.

In addition, packaged waste movement could impact on environmental receptors through, train derailment or road incident from a collision event, or a major fire event; however, the design of the package containers and the over-pack will limit the potential for any failure, as well as the fact that the ILW contained in the boxes will largely be immobile irradiated steel. As a consequence, any release could only arise where temperatures associated with a vehicle fire were sufficiently high enough to change the physical state of the ILW. If such events were to occur, there is the potential that the impact on environmental receptors could be negative; however, the likelihood of any occurring is very small.

In order to determine any scale difference in effects from transport methods it will be important to further understand distance travelled and difference in environmental impacts for each of the transportation options. The level of these effects will also depend upon the total distance to be travelled between location of the dismantling facility and the interim storage facility, which at this point is uncertain. Given that it is expected there will be less than eight 3m^3 boxes of packaged waste to be transported from the dismantling facility to the interim storage facility per year, it is assumed that any adverse effects on other transportation infrastructure will be within a very short time frame and therefore insignificant as it is expected that if transported by train it would significantly reduce the number of movements per year.

As identified previously, the Packaged Waste option will generate some vehicle movements associated with the transportation of workers employed to undertake maintenance activities at the storage facility and security personnel as well as a limited number of HGV movements which could have a negative impact on the local transport network (and users). However, it is anticipated that the number of staff associated with these activities will be minimal and, consequently, the volume of vehicle movements would be low although movements to/from the site will increase during packaged waste unloading and any additional preparatory works prior to storage. It is also assumed that as part of the development of the storage facility, any necessary improvements to existing transport infrastructure will be undertaken (informed by a Transport Assessment and in consultation with the local highways authority) to accommodate additional capacity requirements.

Stage V: Transport RC/RPV/ILW to Interim Storage Materials Assets (Transport)	
Proposed Mitigation / Enhancements Measures: • Seek to minimise the distance travelled by packaged waste between dismantling site and interim storage. • Consider routing and timing of packaged waste transportation to avoid protected areas and minimise impacts on sensitive environmental receptors. • Conduct an evaluation of how the environmental impact differs between each transport option. • Measures to decrease the effects of increases in vehicular greenhouse gas emissions should be implemented where possible. • In order to alleviate the potential stress on road infrastructure from increased vehicle movements, where practicable, provision should be made for the transport of operational materials and wastes via rail or sea. • Emergency response plan to address any potential unplanned events.	
Summary: It is expected that transport of the packaged waste from the dismantling facility to the interim storage facility will have a neutral effect under this objective as the scale of transportation movements is not considered to be significant to trigger an effect. However, due to the location of the dismantling site and the interim storage facility being unknown at this point the distance to be travelled is an uncertainty. Furthermore, there is potential for effects to biodiversity, air quality and climate change/energy dependant on the distance to be travelled and the location of sensitive receptors in relation to the location of both sites.	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Materials Assets (Transport)
Option 1: Reactor Compartment Segregation and Size Reduction, PW Transfer to Proposed GDF

Assessment of Effects:

Depending on the location of the dismantling facility for removal of the RPV from the RC, and the size reduction facility for the packaging of ILW vis-à-vis the interim storage facility, there may be a requirement to transport RC's prior to processing, it is expected due to the size and weight of RC that this will only occur by sea and by barge. Nonetheless, as the location of the dismantling facility and the interim storage facility are currently unknown and therefore it is assumed that there is potential for dredging to be required to enable clear access and egress to the docking facilities required at both the dismantling facility site and the storage site under this option to maintain operation.

This transportation has potential to affect biodiversity, air quality and climate change/energy use and these have been considered in more detail under the relevant topic areas. Risks of accidental discharges are considered to be remote as RC will have undergone preparation for safe transportation. In addition, RC movement could impact on environmental receptors through sea barge sinking from a collision event, sea barge grounding or a major fire event. Although, if these events were to occur the impact on environmental receptors could be negative, the likelihood of any occurring is very small. In order to determine any scale difference in effects from transport methods it will be important to further understand distance travelled and difference in environmental impacts for each of the transportation options. The level of these effects will also depend upon the total distance to be travelled between location of the dismantling facility and the interim storage facility, which at this point is uncertain. Given that it is expected there will be only one movement of RC from the dismantling facility to the interim storage facility per year, it is assumed that any adverse effects on other seaway infrastructure will be within a very short time frame and therefore insignificant.

The movement of plant equipment, materials and waste to and from the site during operations is likely to increase the number of HGV movements in the local area. This could have negative effects on the road infrastructure such as congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the sites' location, the exact route(s) used, the existing road users and the quality of the existing transport network. Increases in HGV movements may also have effects on air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks (this is considered in more detail under the appropriate topics). However, it is considered that the scale of HGV movements required is unlikely to have a significant impact.

Additional to the HGV movements associated with operation the movement of staff is likely to further increase the overall number of vehicle movements in the local area and the associated effects. However, the scale of employees expected is within the order of 20-60 jobs a year, which is considered as unlikely to cause substantial negative effects on the road infrastructure or environment.

As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated risks on adjacent sensitive receptors, the route of the transport is not known however effects to other objectives from transport movements may also provide contributing factors although again these are expected to be minimal. Therefore it is determined that transportation of packaged waste is not expected to pose any significant effect, under normal operating circumstances.

A further set of transportation movements will occur in relation to this option as once the RPV has been removed the remaining (approx 800 tonnes) of the RC casing which is expected to be non radioactive will be cut up and size reduced on site. All items removed or size reduced from the RC casing will be monitored, characterised and transferred to a suitable waste processing facility for recycling or disposal as appropriate. These transportation and recycling activities have potential to affect air quality and climate change/energy use through size reduction activities undertaken during recycling and through the movement of the recyclable materials.

Proposed Mitigation / Enhancements Measures:

- Consider routing and timing of RC transportation to avoid protected areas and minimise impacts on sensitive environmental receptors

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Materials Assets (Transport)	
• Devise and implement a travel plan to encourage staff to use alternatives to single-occupancy car-use. • Measures to decrease the effects of increases in vehicular greenhouse gas emissions should be implemented where possible. • In order to alleviate the potential stress on road infrastructure from increased vehicle movements, where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.	
Summary: Option 1 has been assessed as having a neutral impact on this objective as the scale of increase to vehicle movement in the local area associated with the movement of plant equipment, materials, staff and waste during the processing activities is considered as unlikely to have a negative impact. Depending on where the RCs are stored and where they are to be finally dismantled, they may need to be transported under this stage. However, it is expected that transport of the RC will have a neutral effect under this objective as the scale of transportation movements is not considered to be significant to trigger an effect. However due to the location of the dismantling site and the interim storage facility being unknown at this point there is potential for dredging at both sites to accommodate the access and egress of the sea-barge as well as the distance to be travelled being a further uncertainty. Furthermore, there is potential for effects to biodiversity, air quality and climate change/energy dependant on the distance to be travelled and the location of sensitive receptors in relation to the location of both sites.	**0**
Option 2: Reactor Pressure Vessel Segregation and Size Reduction, PW Transfer to Proposed GDF	
Assessment of Effects Depending on the location of the size reduction facility to process and segregate RPV for the packaging of ILW vis-à-vis the interim storage facility, there may be a requirement to transport RPVs prior to processing The effects of transportation of RPV to the segregation and size reduction facility will depend upon both the distance travelled and the method of transport chosen from road, rail or sea. If the RPV is transported by sea it is expected that the level of effects will likely be the same as have been identified within Option 1, as the location of the dismantling facility and the interim storage facility are currently unknown and therefore it is assumed that there is potential for dredging to be required to enable clear access and egress to the docking facilities required at both the dismantling facility site and the storage site. If the RPV was to be transported by road it would be classed as an abnormal (or oversize) load and would require a specialist vehicle, potential with escort and subject to speed restrictions. As a consequence, it will be important to consider the route taken, timings and the time of day the movement will be made to reduce the likelihood of affecting local transportation routes. If the RPV was to be transported by rail it will be important to consider the journeys to and from the rail transfer facilities, unless a rail connection was available on site at the initial dismantling facility. Considerations would again include the route taken and timings. This stage of transportation has potential to affect biodiversity, air quality and climate change/energy use and these have been considered in more detail under the relevant topic areas. Risks of accidental discharges are considered to be remote as the RPV will have undergone preparation for safe transportation and will be contained within the appropriate level of shielding. However, RPV movement could impact on environmental receptors through sea barge sinking, sea barge grounding, train derailment, road incident from a collision event or a major fire event. The irradiated components within the RPV will be predominately solid steels and will not be mobile. As a consequence, any release could only arise where temperatures associated with a vehicle fire were sufficiently high enough to change the physical state of the ILW. If such events were to occur, there is the potential that the impact on environmental receptors could be negative; however, the likelihood of any occurring is very small. In order to determine any scale difference in effects from transport methods it will be important to further understand distance travelled and	

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF

Materials Assets (Transport)

difference in environmental impacts for each of the transportation options. The level of these effects will also depend upon the total distance to be travelled between location of the dismantling facility and the interim storage facility, which at this point is uncertain. Given that it is expected there will be only one movement of RPV from the dismantling facility to the interim storage facility per year, it is assumed that any adverse effects on other transportation infrastructure will be within a very short time frame and therefore insignificant

The number of vehicle movements required for the movement of plant equipment, materials and waste to and from the site during size reduction of the RPV and processing of packaged waste is expected to be less than for Option 1. This reflects the fact that RPV removal and the associated vehicle movements would not be required under this option and, therefore, the vehicle movements associated with these activities will not be required. Therefore the risk of negative effects on road infrastructure such as congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network is expected to be less than Option 1, and unlikely to have a significant impact.

Additional to the HGV movements associated with operation the movement of staff is likely to further increase the overall number of vehicle movements in the local area and the associated effects. However, the scale of employees expected is between 20-60 jobs a year, which is considered as unlikely to cause substantial negative effects on the road infrastructure or environment.

As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated risks on adjacent sensitive receptors, the route of the transport is not known however effects to other objectives from transport movements may also provide contributing factors although again these are expected to be minimal. Therefore it is determined that transportation of packaged waste is not expected to pose any significant effect, under normal operating circumstances.

Proposed Mitigation / Enhancements Measures

- No additional mitigation measures proposed above those set out for Option 1.

Summary: Option 2 has been assessed as having a neutral impact on this objective as the scale of increase to vehicle movement in the local area associated with the movement of plant equipment, materials, staff and waste during the processing activities and the movement of packaged waste to the proposed GDF is considered as unlikely to have a negative impact. Depending on where the RPVs are stored and where they are to be finally dismantled, they may need to be transported under this stage. However, the transportation of one RPV a year is expected to have minimal and temporary impact on the seaway traffic/infrastructure. The risks of accidental discharges or collision events are considered to be low but if such an event were to occur it could be significantly negative.	**0**

Option 3: Transport Packaged Waste to Proposed GDF

Assessment of Effects:

As all processing activities associated with dismantling the RPV and processing packaged waste will have already occurred for this option under stage 3 the only transport required for this stage will be associated with the movement of packaged waste to the proposed GDF.

As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated risks on adjacent sensitive receptors, the route of the transport is not known however effects to other objectives from transport movements may also provide contributing factors although again these are expected to be minimal. Therefore it is determined that transportation of packaged waste is not expected to pose any significant effect, under normal operating circumstances.

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Materials Assets (Transport)	
Proposed Mitigation / Enhancements Measures • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a neutral impact on this objective as the potential frequency of up to 8 HGV movements per annum to transport the packaged waste to the proposed GDF will not have any effect on this objective.	**0**

Stage VII: Decommissioning the SDP Facilities

Materials Assets (Transport)

Option 1: Decommission Greenfield Sites

Assessment of Effects:

Due to the increased scale of decommissioning activities required to remove all buildings, infrastructure and hardstanding to restore SDP sites to their previous greenfield condition, it is assumed that increased volumes of general waste will be produced relative to Options 2 and 3. This could increase the number of vehicle movements needed to transport the waste off-site for disposal, although there is potential to move much of the demolition material by sea to minimise disruption to users of existing transport networks.

There would also be an increase in the number of vehicle movements required to move staff and equipment during the longer decommissioning period. This would be in addition to the vehicle movements associated with movement of ILW (likely to be present in the hot cell, cut up apparatus and steels within the facility structures) to the proposed GDF and LLW to a repository site, which are expected to remain the same across each of the land use options.

The overall increase in number of vehicle movements compared to other options will increase the potential to significantly increase transport movements on the local road network (e.g. lower order, B and C roads). Effects that could be considered as potentially significant on the road network include congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the sites' location, the exact route(s) used, the existing road users and the quality of the existing transport network. For example, it is considered that greenfield sites may be more likely to be in rural, more isolated areas which will increase the total transport required. Environmental effects associated with increases in vehicle movements could include effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks.

It is expected that road infrastructure added to sites or to the existing transport network during construction phases (Stages 1 and 2 of the SDP process) will need to be removed in order to return sites to their original condition. In the case of new roads it is considered that these roads would be used solely for the access to the site and is therefore unlikely to affect traffic within the road network in the long term, the removal of these roads will increase the total scale of decommissioning thus further increasing the likelihood of effects identified as potentially significant within the assessment. In the case of improvements to the existing road network it is assumed that work to remove this may cause short term disruptions to the road network.

In the longer term, it is expected that following the cessation of decommissioning and all other SDP activities there would be a reduction in the volume of traffic on local road networks.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste storage options and, on a greenfield site, removal of docking facilities alongside other infrastructure would also be required. Therefore, it is expected that this technical option will generate the greatest number of HGV movements in relation to transportation of waste, staff and equipment during the decommissioning stage (depending on the transport option to move the majority of the waste arising) which may cause disruption to local transport networks (and users) and adverse environmental effects. However, under this technical option (and for RPV storage), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects).

Proposed Mitigation / Enhancements Measures:

- To reduce traffic effects during the decommissioning phase of the development, the following mitigation should be implemented:
    - Tender specifications for demolition contractors should provide information on traffic management requirements and request

Stage VII: Decommissioning the SDP Facilities Materials Assets (Transport)	
information from contractors on how measures would be implemented to mitigate traffic and transport effects. o A Traffic Management Plan (TMP) should be prepared and adopted. The TMP is likely to include details on car parking, temporary road signage and decommissioning traffic routing and timing. Traffic movements (particularly HGVs) should be limited along certain routes or at certain times of the day to minimise the effects of congestion and nuisance or intrusion on any nearby residents. o A regularly serviced modern lorry fleet should be used for the collection of waste, transportation of plant and equipment. o The immediate area external to the site, including the site entrances and adjacent road/footpath, should be subject to regular sweeping and washing using a combination of manual and mechanical means. Lorries should pass through wheel washing installations prior to departure in order to minimise dirt on the roads.	
Summary: Option 1 has been assessed as having a long term positive effect in relation to this objective due to the cessation of SDP activities and the expected reduction in the volume of associated traffic on local road networks. However, in the short to medium term there is likely to be a significantly negative effect on this objective due to the increase in transport movements on the local road network especially during the demolition stage of decommissioning (assuming that waste materials are moved off site by road). The negative effect reflects the scale of likely demolition required to remove all buildings and infrastructure from the sites, and the assumption that staff, equipment and waste generated during decommissioning will be transported (in part) by road. Environmental effects associated with increases in vehicle movements could include effects on air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks. The scale and potential significance of effects associated with decommissioning of the interim storage facility is most likely to be greatest under the RC storage option. This reflects the increased footprint of the facility which is expected to create additional HGV movements in relation to staff, equipment and waste movement during the decommissioning phase. However, under this technical option (and for RPV storage), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects).	**--/+**
Option 2: Decommission Brownfield Sites	
Assessment of Effects: The demolition of SDP facilities constructed on brownfield land could result in effects on the transport objective similar to those outlined under Option 1 and include congestion, severance to pedestrians/cyclists, driver delay and increased number and severity of accidents. Environmental effects associated with increases in vehicle movements could include effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks. However, as it is expected that the majority of transport infrastructure required for the development of the sites would have been present prior to development, it is assumed that the scale of decommissioning activity and consequential vehicle movements will be considerably less than for Option 1. This, along with the reduced need for movement of staff and equipment will decrease the total number of vehicle movements required and reduce the potential for negatively effects on the surrounding road networks. In the longer term, it is expected that following the cessation of decommissioning and all other SDP activities there would be a reduction in the volume of traffic on local road networks. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this	

Stage VII: Decommissioning the SDP Facilities **Materials Assets (Transport)**	
assessment. RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste storage options. Therefore, it is expected that this technical option will generate the greatest number of HGV movements in relation to transportation of waste, staff and equipment during the decommissioning stage (depending on the transport option to move the majority of the waste arising) which may cause disruption to local transport networks (and users) and adverse environmental effects. However, under this technical option (and for RPV storage), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects). **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: Option 2 has been assessed as having a long term positive effect in relation to this objective due to the cessation of SDP activities and the expected reduction in the volume of associated traffic on local road networks. However, in the short to medium term, while demolition activities take place, there is likely to be a negative effect in relation to this objective. This is due to the assumption that the scale of decommissioning required will be substantially less than Option 1 and that the associated transport movements required will also be less. As a consequence, the effects of the increase in traffic movements on sensitive receptors whilst negative, are considered less likely to be significant. The scale and potential significance of effects associated with decommissioning of the interim storage facility is most likely to be greatest under the RC storage option. This reflects the increased footprint of the facility which is expected to create additional HGV movements in relation to staff, equipment and waste movement during the decommissioning phase. However, under this technical option (and for RPV storage), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects).	**-/+**
Option 3: Decommission Licensed/Authorised Sites	
Assessment of Effects: The potential effects will be similar in range to those described for Options 1 and 2, namely, congestion, severance to pedestrians/cyclists, driver delay and increased number and severity of accidents. Environmental effects associated with increases in vehicle movements could include effects to air quality, greenhouse gas emissions, local amenity and sensitive receptors (such as people, species and habitats) located adjacent to the road networks. However, given the reduced demolition required under Option 3, it is expected that decommissioning will generate less general waste, decreasing the volumes of waste transported off site for disposal. This, along with the reduced need for movement of staff and equipment will decrease the total number of vehicle movements required and reduce the potential for negatively effects on the surrounding road networks. In the longer term, it is expected that following the cessation of decommissioning and all other SDP activities there would be a reduction in the volume of traffic on local road networks. **Technical Options:** As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence of the technical options on their severity is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	

<table>
<tr><th colspan="2">Stage VII: Decommissioning the SDP Facilities

Materials Assets (Transport)</th></tr>
<tr><td>Summary:

Option 3 has been assessed as having a long term positive effect in relation to this objective due to the cessation of SDP activities and the expected reduction in the volume of associated traffic on local road networks.

However, in the short to medium term, while demolition activities take place, there is likely to be a negative effect in relation to this objective. This is due to the assumption that the scale of decommissioning required will be substantially less than Option 1 and that the associated transport movements required will also be less.

The scale and potential significance of effects associated with decommissioning of the interim storage facility is most likely to be greatest under the RC storage option. This reflects the increased footprint of the facility which is expected to create additional HGV movements in relation to staff, equipment and waste movement during the decommissioning phase. However, under this technical option (and for RPV storage), there may be potential to transport materials by sea given the required coastal location which would help offset any increase in construction traffic (and associated negative effects).</td><td>-/+</td></tr>
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10.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the transport objective. **Box 10.2** provides a summary of the options that have been assessed.

Box 10.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 10.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.	-	-	-	**Potential Effects** There is the potential for submarine transportation to impact on port and marine traffic, communities and the marine environment (e.g. disruption to boating and shipping activities or pollution from accidental spillage). Depending on the extent of usage of each dockyard for submarine dismantling, the number of submarine transport movements required would differ. Any dredging or channel modification to accommodate submarine transportation could also result in an increase in marine traffic or traffic movements on the local road network depending on the method of disposal *(refer to impacts specific to the Devonport and Rosyth dockyards)*. However, it is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required. SDP activities would result in an increase in traffic movements on the local road network associated with staff, HGVs and heavy plant, concrete tankers and deliveries and the transport of waste. Potential effects on the road network include congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the mode of transport, the location of staff and materials, the level of traffic generation and the exact route(s) used *(refer to impacts specific to the Devonport and Rosyth dockyards)*. Dismantling activities are not anticipated to result in any significant impacts on road networks given the volumes of waste that could be generated and timescales involved. This would particularly be the case if materials and wastes are transported by sea or rail respectively. At the Devonport and Rosyth dockyards, there is the potential for materials to be transported to the dockyards by ship. There is also the potential for LLW to be transported to the LLWR by rail. Estimate volumes of waste arisings from construction activities are not available at this stage, although taking account of the scale of development required waste arisings from construction activities requiring transport off-site are not anticipated to be significant. Similarly, transport of LLW is not anticipated to be significant, with LLW volumes requiring transport to the LLWR estimated to be in the order of between 91 tonnes and 514 tonnes per year. The potential impacts on the wider surrounding road network from the transfer of ILW for final disposal in the proposed GDF would depend on its location and therefore cannot be determined at this stage. Notwithstanding this, taking account of volumes of ILW to be transported off-site; estimated to be between 4 and 8 boxes of ILW per submarine, resulting in up to 8 one way trips per year (assuming one $3m^3$ box per HGV and one submarine is dismantled per year), potential effects are not anticipated to be significant. It is not anticipated that any significant improvements or enhancements to the existing road network would be required to accommodate traffic from SDP activities at the Devonport or Rosyth dockyards. Of the technical options, as the scale of development required for the RC option would be greater than the other options, requiring a new interim storage area with a footprint of $11,600m^2$, transport impacts associated with construction activities could be greater. However, in the case of the RC option, construction of SDP facilities would be phased, with initial construction comprising construction of facilities for dismantling and interim storage only. Construction of facilities for full dismantling would not take place until the interim storage period is nearing completion. This would mean that traffic movements would be spread over two phases rather than one period, reducing any potential impacts on the local road network. In addition, ILW would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the RC. Overall, there would be fewer transport movements associated with this option when compared to those options proposing interim storage at a remote site.

Assessment Criteria	Score			Commentary
	1D	1R	1B	
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-	-	-	<u>Devonport Dockyard</u> Devonport dockyard is situated on the southern fringe of the City of Plymouth adjacent to the Hamoaze estuary. The area surrounding the dockyard is predominantly residential. The dockyard is accessed by road off the B3396, which connects to the A3064 to the north-east, and the A386 to the east of the dockyard. Both the A3064 and A386 route through the city of Plymouth. The A38 is located approximately 3km to the north-east of the site, which routes through the northern fringe of Plymouth and can be accessed from the dockyard via the A3064 or the A386. Assuming that traffic would predominantly route to and from Devonport dockyard via the A38 and A3064/A386, which are key routes through the city that accommodate high traffic flows, and taking account of the scale of development required, the volumes of waste that could be generated and the timescales over which transport movements would occur, any traffic arising from SDP activities is not anticipated to result in any significant impacts on the surrounding road network. However, there is the potential for transport movements to and from the dockyard to have a minor impact on the amenity of local residents along local transport routes and contribute to driver delay and congestion in the city. If submarine dismantling were to take place at Devonport dockyard, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. Taking account of submarine transport movements and the timescales over which transport movements would occur, any impacts arising from submarine transportation is not anticipated to result in any significant impacts; however there is the potential for submarine transportation to have a minor impact on port and marine traffic and the amenity of local residents along the submarine transportation route. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. Submarine sections can be transported to the commercial ship recycling facility following initial dismantling in a variety of ways including heavy lift vessel (although this is considered to be the least likely transport option to be implemented), submersible barge or tow (following welding to ensure that they are watertight). In the unlikely event that a heavy lift vessel is used to transport submarines to the dockyard or fore and aft sections to the commercial ship recycling facility, significant dredging would be required to create sufficient deep water (an estimated 300m wide area to a depth of 22-25+ metres would be required for heavy lift operations), which would result in considerable quantities of material requiring disposal. The depth of water in those areas of Plymouth Sound that could be appropriate for heavy lift operations is estimated to be 15m. Taking account of this depth, dredging to 10m to create an area up to 25m deep and 300m wide would produce approx. 706,000 tonnes of dredged material. The transport of dredged material would generate traffic, with the potential for impacts on the transport network. Impacts associated with the transport of dredged material cannot be determined at this stage, as the scale of potential impact would depend on the method of disposal of dredged material (road, rail or sea). However, it is anticipated that disposal on to land would result in a greater number of transport movements than disposal at sea. Taking account of the potential volume of dredged material, transport of dredged material by road is likely to result in a noticeable increase in traffic movements on the local road network. Although it is noted that typically dredged material is disposed of at sea. <u>Rosyth Dockyard</u> Rosyth dockyard is situated to the south of the town of Rosyth adjacent to the Firth of Forth Estuary. The area surrounding the dockyard predominantly comprises industrial land, which surrounds the dockyard, and residential housing associated with Rosyth town to the north. The dockyard is accessed by road off the B980 Castle Road, which connects to the A985 and the A823 (M) to the north of the dockyard. The A90, A921 and the M90 is located approximately 2.5km to the north-east of the site, which can be accessed via the A985.
J. Material Assets (Transport) Minimise the	-	-	-	Assuming that traffic would predominantly route to and from the Rosyth dockyard via the main road network (the M90, A921, A90, A823 (M) or A985, which are key routes that accommodate high traffic flows, and taking account of the scale of development required, the volumes of waste that could be generated and the timescales over which transport

Assessment Criteria	Score			Commentary
	1D	1R	1B	
detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*				movements would occur, any traffic arising from SDP activities is not anticipated to result in any significant impacts on the surrounding road network. There is the potential for transport movements to and from the dockyard to have a minor impact on the amenity of local residents along local transport routes; however traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. If submarine dismantling were to take place at Rosyth dockyard, the 10 submarines stored afloat at Devonport dockyard, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Taking account of submarine transport movements and the timescales over which transport movements would occur, any impacts arising from submarine transportation is not anticipated to result in any significant impacts; however there is the potential for submarine transportation to have a minor impact on port and marine traffic and the amenity of local residents along the submarine transportation route. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible. In the case of Rosyth dockyard, no transport of dredged material would therefore be required. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 1D could therefore potentially have a greater transport impact associated with construction activities. Notwithstanding this, taking account of the scale of development required, this is not anticipated to result in any significant increase in the number of transport movements associated with construction activities in the dockyards. Any impacts on the local road network generated as a result of SDP activities could be greater at Devonport dockyard, due to its location on the fringe of the City of Plymouth, which would require SDP traffic to route through the outskirts of the city. Rosyth dockyard is situated is a less populated area, on the fringe of the town of Rosyth and within easy access of several major routes, including the M90. Traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. In the case of Option 1D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 1R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts associated with submarine transportation could therefore be greater for Option 1R. Depending on the submarine transport method, channel modification and dredging may be required to accommodate heavy lift operations at Devonport dockyard, which would result in additional transport movements in the case of Option 1D associated with the transport of dredged material for disposal. However, it is expected that viable alternatives will be implemented ahead of heavy lift (e.g. wet tow) such that dredging is unlikely to be required. In the case of Rosyth dockyard, no transport of dredged material would be required.

Assessment Criteria	Score			Commentary
	1D	1R	1B	
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-	-	-	<u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would create opportunity to reduce transportation distances of submarines for dismantling, as any submarines currently in afloat storage at Devonport and Rosyth could remain at their respective storage site for dismantling. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-	-	0/-	**Potential Effects** There is the potential for submarine transportation to impact on port and marine traffic, communities and the marine environment (e.g. disruption to boating and shipping activities or pollution from accidental spillage). Depending on the extent of usage of each dockyard for submarine dismantling, the number of submarine transport movements required would differ. It is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required. SDP activities would result in an increase in traffic movements on the local road network associated with staff, HGVs and heavy plant, concrete tankers and deliveries and the transport of waste. Potential effects on the road network include congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the mode of transport, the location of staff and materials, the level of traffic generation and the exact route(s) used *(refer to impacts specific to the Devonport and Rosyth dockyards)*. SDP activities are not anticipated to result in any significant impacts on road networks given the volumes of waste that could be generated and timescales involved. This would particularly be the case if materials and wastes are transported by sea or rail respectively. At the Devonport and Rosyth dockyards, there is the potential for materials to be transported to the dockyards by ship. There is also the potential for LLW to be transported to the LLWR by rail. Estimate volumes of waste arisings from construction activities are not available at this stage, although taking account of the scale of development required waste arisings from construction activities requiring transport off-site are not anticipated to be significant. Similarly, transport of LLW is not anticipated to be significant, with LLW volumes requiring transport to the LLWR estimated to be between 91 tonnes and 514 tonnes per year. The potential impacts on the wider surrounding road network from the transfer of ILW for final disposal in the proposed GDF would depend on its location and therefore cannot be determined at this stage. Notwithstanding this, taking account of volumes of ILW to be transported off-site; estimated to be between 4 and 8 boxes of ILW per submarine, resulting in up to 8 one way per year (assuming one 3m^3 box per HGV and one submarine is dismantled per year), potential effects are not anticipated to be significant. It is not anticipated that any significant improvements or enhancements to the existing road network would be required to accommodate traffic from SDP activities at the Devonport or Rosyth dockyards. Of the technical options, the scale of development required for the RPV option would be smaller than the other technical options, with the RPV option requiring a new interim storage area with a footprint of 801m^2. It is assumed that the RPV option would therefore generate the least transport movements associated with construction (as the scale of constructed facility would be smaller).
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.	-	-	0/-	In addition, in the case of the RPV option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for full dismantling would not take place until the interim storage period is nearing completion. This would mean that traffic movements would be spread over two phases rather than one period, reducing any potential impacts on the local road network. In addition, ILW would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the RPV. Overall, there would be fewer transport movements associated with this option when compared to those options proposing interim storage at a remote site. Devonport Dockyard Devonport dockyard is situated on the southern fringe of the City of Plymouth adjacent to the Hamoaze estuary. The area surrounding the dockyard is predominantly residential.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				The dockyard is accessed by road off the B3396, which connects to the A3064 to the north-east, and the A386 to the east of the dockyard. Both the A3064 and A386 route through the city of Plymouth. The A38 is located approximately 3km to the north-east of the site, which routes through the northern fringe of Plymouth and can be accessed from the dockyard via the A3064 or the A386. Assuming that traffic would predominantly route to and from Devonport dockyard via the A38 and A3064/A386, which are key routes through the city that accommodate high traffic flows, and taking account of the scale of development required, the volumes of waste that could be generated and the timescales over which transport movements would occur, any traffic arising from SDP activities is not anticipated to result in any significant impacts on the surrounding road network. However, there is the potential for transport movements to and from the dockyard to have a minor impact on the amenity of local residents along local transport routes and contribute to driver delay and congestion in the city. There are currently 10 submarines stored afloat at Devonport dockyard, 7 submarines at Rosyth dockyard and 10 in-service submarines that will require defuelling at Devonport dockyard. If submarine dismantling were to take place at Devonport dockyard, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. Taking account of submarine transport movements and the timescales over which transport movements would occur, any impacts arising from submarine transportation is not anticipated to result in any significant impacts; however there is the potential for submarine transportation to have a minor impact on port and marine traffic and the amenity of local residents along the submarine transportation route. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-	-	0/-	<u>Rosyth Dockyard</u> Rosyth dockyard is situated to the south of the town of Rosyth adjacent to the Firth of Forth Estuary. The area surrounding the dockyard predominantly comprises industrial land, which surrounds the dockyard, and residential housing associated with Rosyth town to the north. The dockyard is accessed by road off the B980 Castle Road, which connects to the A985 and the A823 (M) to the north of the dockyard. The A90, A921 and the M90 is located approximately 2.5km to the north-east of the site, which can be accessed via the A985. Assuming that traffic would predominantly route to and from the Rosyth dockyard via the main road network (the M90, A921, A90, A823 (M) or A985, which are key routes that accommodate high traffic flows, and taking account of the scale of development required, the volumes of waste that could be generated and the timescales over which transport movements would occur, any traffic arising from SDP activities is not anticipated to result in any significant impacts on the surrounding road network. There is the potential for transport movements to and from the dockyard to have a minor impact on the amenity of local residents along local transport routes; however traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. If submarine dismantling were to take place at Rosyth dockyard, the 10 submarines stored afloat at Devonport dockyard, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Taking account of submarine transport movements and the timescales over which transport movements would occur, any impacts arising from submarine transportation is not anticipated to result in any significant impacts; however there is the potential for submarine transportation to have a minor impact on port and marine traffic and the amenity of local residents along the submarine transportation route. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 2D could therefore potentially have a greater transport impact associated with construction activities. Notwithstanding this, taking account of the scale of development required, this is not anticipated to result in any significant increase in the number of transport movements associated with construction activities in the dockyards. Any impacts on the local road network generated as a result of SDP activities could be greater at Devonport dockyard due to its location on the fringe of the City of Plymouth, which would require SDP traffic to route through the outskirts of the city. Rosyth dockyard is situated is a less populated area, on the fringe of the town of Rosyth and within easy access of several major routes, including the M90. Traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. In the case of Option 2D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 2R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts associated with submarine transportation could therefore be greater for Option 2R.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-	-	0/-	Depending on the submarine transportation method, significant dredging may be required to accommodate heavy lift operations at Devonport dockyard, which would result in additional transport movements associated with the transport of dredged material for disposal if required. However, it is expected that viable alternatives will be implemented ahead of heavy lift (e.g. wet tow) such that dredging is unlikely to be required. In the case of Rosyth dockyard, no transport of dredged material would be required. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would create opportunity to reduce transportation distances of submarines for dismantling, as any submarines currently in afloat storage at Devonport and Rosyth could remain at their respective storage site for dismantling. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled.

Options 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.	-/?	-/?	-/?	**Potential Effects** There is the potential for submarine transportation to impact on port and marine traffic, communities and the marine environment (e.g. disruption to boating and shipping activities or pollution from accidental spillage). Depending on the extent of usage of each dockyard for submarine dismantling, the number of submarine transport movements required would differ. It is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required. SDP activities would result in an increase in traffic movements on the local road network associated with staff, HGVs and heavy plant, concrete tankers and deliveries, the transport of the RPVs for interim storage and the transport of waste. Potential effects on the road network include congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the mode of transport, the location of staff and materials, the level of traffic generation and the exact route(s) used *(refer to impacts specific to the Devonport and Rosyth dockyards)*. SDP activities are not anticipated to result in any significant impacts on road networks given the volumes of waste that could be generated and timescales involved. This would particularly be the case if materials and wastes are transported by sea or rail respectively. At the Devonport and Rosyth dockyards, there is the potential for construction materials associated with dismantling activities to be transported to the dockyards by ship. There is also the potential for LLW arisings from dismantling activities to be transported to the LLWR by rail. Estimate volumes of waste arisings from construction activities are not available at this stage, although taking account of the scale of development required waste arisings from construction activities requiring transport off-site are not anticipated to be significant. Similarly, transport of LLW is not anticipated to be significant, with LLW volumes requiring transport to the LLWR estimated to be in the order of between 91 tonnes and 514 tonnes per year. In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation (full dismantling of the RPV). Depending on the location of the remote site and the mode of transport there is the potential for RPV transportation to impact on the road network on a very specific and localised basis. However, in taking account of the number of RPVs to be transported (assumed to be 27 RPVs – a total of 27 one way trips in total), these potential effects (congestion) are not anticipated to be negligible over the life of the project.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-/?	-/?	-/?	The potential impacts on the wider surrounding road network from the transfer of ILW from the remote site for final disposal in the proposed GDF would depend on its location and therefore cannot be determined at this stage. Notwithstanding this, taking account of volumes of ILW to be transported off-site; estimated to be between 4 and 8 boxes of ILW per submarine, resulting in up to 8 one way per year (assuming one $3m^3$ box per HGV and one submarine is dismantled per year), potential effects are not anticipated to be significant. It is not anticipated that any significant improvements or enhancements to the existing road network would be required to accommodate traffic from dismantling activities at the Devonport or Rosyth dockyards. As a commercial site for interim storage has not been identified at this stage it is unknown whether there would be any opportunity to transport the RPVs from the dismantling site to the remote site, or materials and wastes to and from the remote site, via rail or sea. Of the technical options, the scale of development required for the RPV option would be smaller than the other technical options, with the RPV option requiring a new interim storage

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				area with a footprint of 801m^2. It is assumed that the RPV option could therefore generate the least transport movements associated with construction (as the scale of constructed facility would be smaller). In addition, construction would also take place on two different sites, reducing any traffic impacts from SDP activities on the local road network as the scale of activity undertaken at the respective sites would be less. In the case of the RPV option construction of SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for segregation/size reduction of the RPV would not take place until after the interim storage period. This would mean that traffic movements would be spread over two phases rather than one period, reducing any potential impacts on road networks. However, as the RPVs would be transported off the dismantling site to a remote site for interim storage following initial dismantling; overall this option would result in a greater number of transport movements when compared to those options proposing interim storage at the point of waste generation. Devonport Dockyard Devonport dockyard is situated on the southern fringe of the City of Plymouth adjacent to the Hamoaze estuary. The area surrounding the dockyard is predominantly residential. The dockyard is accessed by road off the B3396, which connects to the A3064 to the north-east, and the A386 to the east of the dockyard. Both the A3064 and A386 route through the city of Plymouth. The A38 is located approximately 3km to the north-east of the site, which routes through the northern fringe of Plymouth and can be accessed from the dockyard via the A3064 or the A386. Assuming that traffic would predominantly route to and from Devonport dockyard via the A38 and A3064/A386, which are key routes through the city that accommodate high traffic flows, and taking account of the scale of development required, the volumes of waste that could be generated and the timescales over which transport movements would occur, any traffic arising from dismantling activities and the transport of RPVs off-site is not anticipated to result in any significant impacts on the surrounding road network. However, there is the potential for transport movements to and from the dockyard to have a minor impact on the amenity of local residents along local transport routes and contribute to driver delay and congestion in the city. If submarine dismantling were to take place at Devonport dockyard, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. Taking account of submarine transport movements and the timescales over which transport movements would occur, any impacts arising from submarine transportation is not anticipated to result in any significant impacts; however there is the potential for submarine transportation to have a minor impact on port and marine traffic and the amenity of local residents along the submarine transport route.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-/?	-/?	-/?	Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard Rosyth Dockyard Rosyth dockyard is situated to the south of the town of Rosyth adjacent to the Firth of Forth Estuary. The area surrounding the dockyard predominantly comprises industrial land, which surrounds the dockyard, and residential housing associated with Rosyth town to the north. The dockyard is accessed by road off the B980 Castle Road, which connects to the A985 and the A823 (M) to the north of the dockyard. The A90, A921 and the M90 is located approximately 2.5km to the north-east of the site, which can be accessed via the A985. Assuming that traffic would predominantly route to and from the Rosyth dockyard via the main road network (the M90, A921, A90, A823 (M) or A985, which are key routes that accommodate high traffic flows, and taking account of the scale of development required, the volumes of waste that could be generated and the timescales over which transport movements would occur, any traffic arising from dismantling activities and the transport of RPVs off-site is not anticipated to result in any significant impacts on the surrounding road network. There is the potential for transport movements to and from the dockyard to have a

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				minor impact on the amenity of local residents along local transport routes; however traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. If submarine dismantling were to take place at Rosyth dockyard, the 10 submarines stored afloat at Devonport dockyard, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Taking account of submarine transport movements and the timescales over which transport movements would occur, any impacts arising from submarine transportation is not anticipated to result in any significant impacts; however there is the potential for submarine transportation to have a minor impact on port and marine traffic and the amenity of local residents along the submarine transportation route. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard **Comparison of the Options** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-/?	-/?	-/?	Any impacts on the local road network generated as a result of dismantling activities could be greater at Devonport dockyard, due to its location on the fringe of the City of Plymouth, which would require traffic to route through the outskirts of the city. Rosyth dockyard is situated is a less populated area, on the fringe of the town of Rosyth and within easy access of several major routes, including the M90. Traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. In the case of Option 3/4D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 3/4R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts associated with submarine transportation could therefore be greater for Option 3/4R. At this stage a remote site for interim storage has not been identified and subsequently the potential transport impact of interim storage and segregation/size reduction activities is uncertain at this stage. The potential for effects would depend on the location of the remote site, the existing transport infrastructure in place, the scale of development required and the proximity of sensitive receptors. Combination Option If both the Devonport and Rosyth dockyards are utilised for dismantling activities, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites for dismantling would create opportunity to reduce transportation distances of submarines for dismantling, as any submarines currently in afloat storage at Devonport and Rosyth could remain at their respective storage site for dismantling. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.	-	-	0/-	**Potential Effects** There is the potential for submarine transportation to impact on port and marine traffic, communities and the marine environment (e.g. disruption to boating and shipping activities or pollution from accidental spillage). Depending on the extent of usage of each dockyard for submarine dismantling, the number of submarine transport movements required would differ. It is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required. SDP activities would result in an increase in traffic movements on the local road network associated with staff, HGVs and heavy plant, concrete tankers and deliveries and the transport of waste. Potential effects on the road network include congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the mode of transport, the location of staff and materials, the level of traffic generation and the exact route(s) used *(refer to impacts specific to the Devonport and Rosyth dockyards)*. Dismantling activities are not anticipated to result in any significant impacts on road networks given the volumes of waste that could be generated and timescales involved. This would particularly be the case if materials and wastes are transported by sea or rail respectively. At the Devonport and Rosyth dockyards, there is the potential for materials to be transported to the dockyards by ship. There is also the potential for LLW to be transported to the LLWR by rail. Although estimated volumes of waste arisngs from construction activities are not available at this stage, taking account of the scale of development required LLW arisings from construction activities are not anticipated to be significant, with LLW volumes estimated to be in the order of between 91 tonnes and 514 tonnes per year. The potential impacts on the wider surrounding road network from the transfer of ILW for final disposal in the proposed GDF would depend on its location and therefore cannot be determined at this stage. Notwithstanding this, taking account of volumes of ILW to be transported off-site; estimated to be between 4 and 8 boxes of ILW per submarine, resulting in up to 8 one way trips per year (assuming one 3m^3 box per HGV and one submarine is dismantled per year), potential effects are not anticipated to be significant. It is not anticipated that any significant improvements or enhancements to the existing road network would be required to accommodate traffic from SDP activities at the Devonport or Rosyth dockyards.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-	-	0/-	Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. Any transport impacts associated with construction for the PW option could therefore be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full early dismantling of the RPV and segregating the ILW and LLW prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There is therefore a greater potential for construction traffic to impact on road networks when compared to the other options, which phase construction. In the case of this option, ILW would be stored at the point of waste generation and therefore the only transportation required for interim storage would be the on-site transfer of the PW. Overall, there would be fewer transport movements associated with this option when compared to those options proposing interim storage at a remote site. <u>Devonport Dockyard</u> Devonport dockyard is situated on the southern fringe of the City of Plymouth adjacent to the Hamoaze estuary. The area surrounding the dockyard is predominantly residential.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				The dockyard is accessed by road off the B3396, which connects to the A3064 to the north-east, and the A386 to the east of the dockyard. Both the A3064 and A386 route through the city of Plymouth. The A38 is located approximately 3km to the north-east of the site, which routes through the northern fringe of Plymouth and can be accessed from the dockyard via the A3064 or the A386. Assuming that traffic would predominantly route to and from Devonport dockyard via the A38 and A3064/A386, which are key routes through the city that accommodate high traffic flows, and taking account of the scale of development required, the volumes of waste that could be generated and the timescales over which transport movements would occur, any traffic arising from SDP activities is not anticipated to result in any significant impacts on the surrounding road network. However, there is the potential for transport movements to and from the dockyard to have a minor impact on the amenity of local residents along local transport routes and contribute to driver delay and congestion in the city. If submarine dismantling were to take place at Devonport dockyard, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. Taking account of submarine transport movements and the timescales over which transport movements would occur, any impacts arising from submarine transportation is not anticipated to result in any significant impacts; however there is the potential for submarine transportation to have a minor impact on port and marine traffic and the amenity of local residents along the submarine transport route. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-	-	0/-	<u>Rosyth Dockyard</u> Rosyth dockyard is situated to the south of the town of Rosyth adjacent to the Firth of Forth Estuary. The area surrounding the dockyard predominantly comprises industrial land, which surrounds the dockyard, and residential housing associated with Rosyth town to the north. The dockyard is accessed by road off the B980 Castle Road, which connects to the A985 and the A823 (M) to the north of the dockyard. The A90, A921 and the M90 is located approximately 2.5km to the north-east of the site, which can be accessed via the A985. Assuming that traffic would predominantly route to and from the Rosyth dockyard via the main road network (the M90, A921, A90, A823 (M) or A985, which are key routes that accommodate high traffic flows, and taking account of the scale of development required, the volumes of waste that could be generated and the timescales over which transport movements would occur, any traffic arising from SDP activities is not anticipated to result in any significant impacts on the surrounding road network. There is the potential for transport movements to and from the dockyard to have a minor impact on the amenity of local residents along local transport routes; however traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. If submarine dismantling were to take place at Rosyth dockyard, the 10 submarines stored afloat at Devonport dockyard, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Taking account of submarine transport movements and the timescales over which transport movements would occur, any impacts arising from submarine transportation is not anticipated to result in any significant impacts; however there is the potential for submarine transportation to have a minor impact on port and marine traffic and the amenity of local residents along the submarine transport route. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 1D could therefore potentially have a greater transport impact associated with construction activities.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				Notwithstanding this, taking account of the scale of development required, this is not anticipated to result in any significant increase in the number of transport movements associated with construction activities in the dockyards. Any impacts on the local road network generated as a result of SDP activities could be greater at Devonport dockyard due to its location on the fringe of the City of Plymouth, which would require SDP traffic to route through the outskirts of the city. Rosyth dockyard is situated is a less populated area, on the fringe of the town of Rosyth and within easy access of several major routes, including the M90. Traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. In the case of Option 5D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 5R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts associated with submarine transportation could therefore be greater for Option 5R.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-	-	0/-	<u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. At this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. It is noted that as submarine dismantling activities would be undertaken on two different sites (initial dismantling of the RPV taking place at one dockyard, and full dismantling of the RPV and interim storage taking place at the other dockyard), this combination option could result in a greater number of transport movements compared to Options 5D and 5R, although as two different sites would be utilised the potential impact on the road network could be less.

Options 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.	-/?	-/?	0/-/?	**Potential Effects** There is the potential for submarine transportation to impact on port and marine traffic, communities and the marine environment (e.g. disruption to boating and shipping activities or pollution from accidental spillage). Depending on the extent of usage of each dockyard for submarine dismantling, the number of submarine transport movements required would differ. It is expected that submarines will be towed to the dockyard for dismantling such that dredging is unlikely to be required. SDP activities would result in an increase in traffic movements on the local road network associated with staff, HGVs and heavy plant, concrete tankers and deliveries, the transport of the RPVs for interim storage and the transport of waste. Potential effects on the road network include congestion, severance to pedestrians/cyclists induced by the flow of vehicles along a road, driver delay, loss of pedestrian/cyclist amenity, and increased number and severity of accidents as a result of an increase in traffic on the road network. The significance of such effects would depend on the mode of transport, the location of staff and materials, the level of traffic generation and the exact route(s) used *(refer to impacts specific to the Devonport and Rosyth dockyards)*. SDP activities are not anticipated to result in any significant impacts on road networks given the volumes of waste that could be generated and timescales involved. This would particularly be the case if materials and wastes are transported by sea or rail respectively. At the Devonport and Rosyth dockyards, there is the potential for construction materials to be transported to the dockyards by ship. There is also the potential for LLW to be transported to the LLWR by rail. Estimate volumes of waste arisings from construction activities are not available at this stage, although taking account of the scale of development required waste arisings from construction activities requiring transport off-site are not anticipated to be significant. In the case of this option, following initial dismantling (RPV removal) the RPVs would be transported to another dockyard for segregation and size reduction. There is the potential for RPV transportation to impact on the road network on a very specific and localised basis. However, in taking account of the number of RPVs to be transported (assumed to be 27 RPVs – a total of 27 one way trips in total), these potential effects (congestion) are not anticipated to be negligible over the life of the project. Following full dismantling of the RPVs, the LLW would be transported off the segregation/size reduction site for disposal in the LLWR as appropriate, and the PW (ILW) would be transported off the segregation/size reduction site to a remote site for interim storage.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-/?	-/?	0/-/?	Transport of LLW is not anticipated to be significant, with LLW volumes requiring transport to the LLWR estimated to be in the order of between 91 tonnes and 514 tonnes per year. The potential impacts on the wider surrounding road network from the transport of packaged ILW for interim storage at a remote site and the subsequent transport of ILW for final disposal in the proposed GDF would depend on the location of the remote site and the proposed GDF and therefore cannot be determined at this stage. Notwithstanding this, taking account of volumes of ILW to be transported off-site; estimated to be between 4 and 8 boxes of ILW per submarine, resulting in up to 8 one way per year (assuming one $3m^3$ box per HGV and one submarine is dismantled per year), potential effects are not anticipated to be significant. It is not anticipated that any significant improvements or enhancements to the existing road network would be required to accommodate traffic from SDP activities at the Devonport or Rosyth dockyards. As a remote site for interim storage has not been identified at this stage it is unknown whether there would be any opportunity to transport the PW from the segregation/size reduction site to the remote site, or materials and wastes to and from the remote site, via rail or sea. Similarly, it is unknown whether any significant improvements or enhancements to existing transport networks would be required to transport the PW and to accommodate

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				traffic from interim storage activities. Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. For the PW option, the number of transport movements associated with construction could therefore be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full segregation and size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV, resulting in a greater number of transport movements than the RC and RPV options which phase construction. Notwithstanding this, undertaking SDP activities in one phase would help to reduce the time period over which impacts would occur. In the case of this option construction would also take place on three different sites, reducing any traffic impacts from SDP activities on the local road network as the scale of activity undertaken at the respective sites would be less. As the RPVs would be transported from the initial dismantling site to another dockyard fro segregation/size reduction, and the PW would be transported from the segregation/size reduction site to a remote site for interim storage; overall this option would result in a greater number of transport movements when compared to those options proposing dismantling with storage at point of waste generation. <u>Devonport Dockyard</u> Devonport dockyard is situated on the southern fringe of the City of Plymouth adjacent to the Hamoaze estuary. The area surrounding the dockyard is predominantly residential. The dockyard is accessed by road off the B3396, which connects to the A3064 to the north-east, and the A386 to the east of the dockyard. Both the A3064 and A386 route through the city of Plymouth. The A38 is located approximately 3km to the north-east of the site, which routes through the northern fringe of Plymouth and can be accessed from the dockyard via the A3064 or the A386. Assuming that traffic would predominantly route to and from Devonport dockyard via the A38 and A3064/A386, which are key routes through the city that accommodate high traffic flows, and taking account of the scale of development required, the volumes of waste that could be generated and the timescales over which transport movements would occur, any traffic arising from dismantling and segregation/size reduction is not anticipated to result in any significant impacts on the surrounding road network. However, there is the potential for transport movements to and from the dockyard to have a minor impact on the amenity of local residents along local transport routes and contribute to driver delay and congestion in the city.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects. *(continued)*	-/?	-/?	0/-/?	If submarine dismantling were to take place at Devonport dockyard, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. Taking account of submarine transport movements and the timescales over which transport movements would occur, any effects arising from submarine transportation are not anticipated to result in any significant impacts; however there is the potential for submarine transportation to have a minor impact on port and marine traffic and the amenity of local residents along the submarine transportation route. Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. <u>Rosyth Dockyard</u> Rosyth dockyard is situated to the south of the town of Rosyth adjacent to the Firth of Forth Estuary. The area surrounding the dockyard predominantly comprises industrial land, which surrounds the dockyard, and residential housing associated with Rosyth town to the north. The dockyard is accessed by road off the B980 Castle Road, which connects to the A985 and the A823 (M) to the north of the dockyard. The A90, A921 and the M90 is located approximately 2.5km to the north-east of the site, which can be accessed via the A985. Assuming that traffic would predominantly route to and from the Rosyth dockyard via the main road network (the M90, A921, A90, A823 (M) or A985, which are key routes that accommodate high traffic flows, and taking account of the scale of development required, the volumes of waste that could be generated and the timescales over which transport

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				movements would occur, any traffic arising from dismantling and segregation/size reduction is not anticipated to result in any significant impacts on the surrounding road network. There is the potential for transport movements to and from the dockyard to have a minor impact on the amenity of local residents along local transport routes; however traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. If submarine dismantling were to take place at Rosyth dockyard, the 10 submarines stored afloat at Devonport dockyard, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Taking account of submarine transport movements and the timescales over which transport movements would occur, any impacts arising from submarine transportation is not anticipated to result in any significant impacts; however there is the potential for submarine transportation to have a minor impact on port and marine traffic and the amenity of local residents along the submarine transportation route.
J. Material Assets (Transport) Minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.	-/?	-/?	0/-/?	Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 6/8D could therefore potentially have a greater transport impact associated with construction activities in the dockyards. Any impacts on the local road network generated as a result of dismantling activities could be greater at Devonport dockyard, due to its location on the fringe of the City of Plymouth, which would require traffic to route through the outskirts of the city. Rosyth dockyard is situated is a less populated area, on the fringe of the town of Rosyth and within easy access of several major routes, including the M90. Traffic to/from Rosyth dockyard can be routed to avoid travel through the residential areas of Rosyth. In the case of Option 6/8D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 6/8R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. The potential for impacts associated with submarine transportation could therefore be greater for Option 6/8R. At this stage a remote site for interim storage has not been identified and subsequently the potential transport impact of interim storage activities is uncertain at this stage. The potential for effects would depend on the location of the remote site, the existing transport infrastructure in place, the scale of development required and the proximity of sensitive receptors. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that as submarine dismantling activities would be undertaken on three different sites (initial dismantling of the RPV taking place at one dockyard, and full dismantling of the RPV taking place at the other dockyard and interim storage of the PW at a remote site), this combination option could result in a greater number of transport movements compared to Options 6/8D and 6/8R.

A11. Waste Management

11.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on waste management. Information is presented for both national and sub-regional levels.

Waste management in this context is defined as the processing, recycling or disposal of a range of waste types including municipal, commercial and industrial, construction, excavation and demolition and hazardous wastes. However, it is important to note that consideration of the management of waste links to a number of other SEA topics, the most relevant being climate change and adaptation given the potential for waste to be recovered for energy use.

11.2 Summary of Plans and Programmes

11.2.1 International

The ***Waste Framework Directive*** (75/442/EEC as amended by 91/156/EEC, 91/92/EEC and 2008/98/EC) provides the overarching framework for waste management at the EU level. It relates to waste disposal and the protection of the environment from harmful effects caused by the collection, transport, treatment, storage and tipping of waste. In particular, it aims to encourage the recovery and use of waste in order to conserve natural resources. The key principles of the Directive include the 'Waste Management Hierarchy' which stipulates waste management options based on their desirability. In order, these are:

- Prevention;
- Preparing for re-use;
- Recycling;
- Other recovery, e.g. energy recovery; and

- Disposal.

A compromise agreement was reached between the Council of Environment Ministers and the European Parliament in June 2008 on revisions to the Waste Framework Directive. Once formally adopted, these will come into force in 2010. The main changes include EU-wide targets for reuse and recycling 50% of household waste by 2020, and for reuse, recycling and recovery of 70% of construction and demolition waste by 2020. In this context, the ***Landfill Directive*** (European Commission, 1999) focuses on waste minimisation and increasing levels of recycling and recovery. The overall aim of the Directive is to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air and on the global environment, including the greenhouse effect as well as any resulting risk to human health from the landfilling of waste, during the whole lifecycle of the landfill. The Directive sets the target of reducing biodegradable municipal waste landfilled to 35% of that produced in 1995 by 2020.

The ***EU Thematic Strategy on the Prevention and Recycling of Waste (2002-2012)*** is a long-term strategy aims to help Europe become a recycling society that seeks to avoid waste and uses waste as a resource.

The ***Basel Convention*** came into force in 1992 and is a global agreement, ratified by several member countries and the European Union, for addressing the problems and challenges posed by hazardous waste. The key objectives of the Basel Convention are:

- to minimise the generation of hazardous wastes in terms of quantity and hazardousness;
- to dispose of them as close to the source of generation as possible; and
- to reduce the movement of hazardous wastes.

Initially created to coordinate the Member States' research programmes for the peaceful use of nuclear energy, the ***Euratom Treaty (1957)*** today helps to pool knowledge, infrastructure and funding of nuclear energy. It ensures the security of atomic energy supply within the framework of a centralised monitoring system.

The main objective of the ***Shipments of radioactive waste (Directive 92/3/Euratom)*** is to establish a system of control and prior authorisation for shipments of radioactive waste, to protect the health of workers and the general public and to avoid illicit traffic of such materials.

11.2.2 National

UK

Environmental Permitting (England and Wales) Regulations (2010) SI 675 provides a system for environmental permits and exemptions for industrial activities, mobile plant, waste operations, mining waste operations, water discharge activities, groundwater activities and radioactive substances activities. It also sets out the powers, functions and duties of the regulators.

The ***Greening Government Commitments*** were announced in March 2011, this will replace the SOGE targets which they expired in 2010/11, the framework includes challenging targets on waste reduction and recovery.

The main objectives of the ***UK Ship Recycling Strategy (2007)*** are:

- to develop a strategic approach to the recycling of UK-flagged vessels consistent with the UK's national and international sustainable development commitments; and
- to encourage, through the provision of guidance, the development of UK capacity for recycling of end-of-life vessels in an environmentally sound manner.

The ***United Kingdom Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry strategy*** (2010) , produced by the Nuclear Decommissioning Authority, provides a framework for continued capability and capacity for the safe, secure and environmentally responsible management and disposal of LLW in the UK. The strategy outlines the following key principles for the management of LLW throughout the UK.

High Activity Sealed Radioactive Sources and Orphan Sources Regulations (2005) SI 2686 specifies how high-activity sealed radioactive sources should be registered, kept, used or disposed of. Also covers detecting, recovering and dealing with radioactive sources that are not currently regulated ('orphan sources').

Ionising Radiations Regulations (1999) SI 3232 requires employers to protect employees and other people against ionising radiation arising from work with radioactive substances and other sources of ionising radiation. Also imposes certain duties on employees

MOD Sustainable Development Strategy (2008) and ***MOD Sustainable Development Report and Action Plan (2008)*** includes the following relevant waste objectives;

- to recover and recycle more waste than is sent to landfill by 2012; and
- become a zero waste to landfill organisation by 2020.

England

The ***Waste Strategy for England*** **(*2007)*** was prepared by Defra in response to Section 92 of the ***Environment Act 1995*** which placed a responsibility on the Environment Agency to produce a National Waste Strategy in accordance with the demands of EC Directive 99/31/EC, on the landfill of waste and various other EC legislation on waste. It includes the objective to decouple waste growth (in all sectors) from economic growth and put more emphasis on waste prevention and re-use

PPS10: Planning for Sustainable Waste Management (2005) sets out the national planning framework in relation to waste. It states that planning has a key role in delivering sustainable waste management through both the development of appropriate strategies for growth, regeneration and the prudent use of resources and by providing sufficient opportunities for the development of new waste management facilities.

Defra's ***Strategy for Hazardous Waste Management in England (2010)*** sets out the following principles for hazardous waste management;

- Waste Hierarchy;
- Infrastructure Provision;
- Reduce our Reliance on Landfill;
- No Mixing or Dilution;
- Treatment of Hazardous Organic Wastes; and
- End reliance on the use of Landfill Directive waste acceptance criteria derogations.

Scotland

Scotland's Zero Waste Plan (2010) sets out strategic direction for resource streams, economic opportunity, resource management sector and education and awareness. In addition, it includes targets of recycling 70% of all Scotland's waste, and only 5% of remaining waste ending up in landfill by 2025.

The ***Scottish Planning Policy (2010)*** sets out a sustainable approach to waste management planning relies on a number of objectives including those reflected in the waste hierarchy, reduced reliance on landfill and a set of policy and spatial principles including the polluter pays; the precautionary and proximity principles (which address waste management, waste transport, environmental and health issues and cumulative impact).

Scotland's Higher Activity Radioactive Waste Policy (2011) provides the framework for the long term management of higher activity radioactive waste arising Scotland. The Scottish Government's policy for higher activity radioactive waste is to support long-term near surface, near site storage and disposal facilities so that the waste is monitorable and retrieveable and the need for transporting it over long distances is minimal. The aim of the Policy is to ensure that all activities for the long-term management of the waste are made in a way that protects the health and interests of people and the integrity of the environment now and in the future.

Wales

Towards Zero Waste, One Wales: One Planet – Overarching Waste Strategy Document for Wales (2010) sets out a long-term aim of zero waste by 2050 and a medium term aim of achieving a high recycling society by 2025. This is supported by a range of recycling and other waste management targets including in relation to commercial and industrial waste.

Technical Advice Note 21 (TAN21) (2001) sets out the following key principles in relate to the management of waste:

- proximity - waste should be treated and or disposed of as near to the source of origin as possible and as far as practically possible;
- self-sufficiency - waste should be treated or disposed of within a sensibly defined region; and
- the waste hierarchy - to manage waste in accordance with the following hierarchy: reduce; re-use; recover; disposal.

Northern Ireland

A key objective of ***Towards Resource Management: The Northern Ireland Waste Management Strategy 2006-2020*** is to move away from waste to resources management to ensure quantities of waste produced are reduced and where it is generated it is managed in a way that minimises its impact on the environment and public health and contributes positively to economic and social development. It includes targets for increasing levels of recycling and reuse by 2020 for various waste streams including; 60% of commerical and industrial waste to be recyled or reused by 2020, 75% of construction, demolition and excavation wastes to be recycled or reused by 2020 and 45% of household wastes to be recycled or composted by 2020.

Radioactive Material (Road Transport) (Northern Ireland) Order (1992) sets out measures to regulate the transportation of radioactive material by road in Northern Ireland, including prohibition and enforcement notices, powers of entry and offences.

11.2.3 Sub-regional locations

Plymouth

Plymouth's Waste Development Plan Document (2008) provides a part of Plymouth's Local Development Framework. Objectives include;

- Allocating sufficient and appropriate land within the city that is capable of accommodating a range of strategic waste management and treatment facilities. Providing sufficient capacity to meet Plymouth's needs and, if possible, additional capacity to manage and treat waste from adjoining areas.
- Providing a positive planning framework to support the accommodation of sustainable commercial and industrial waste management facilities
- Providing local waste management facilities, either on strategic waste management sites or at a range of other smaller sites.
- Providing a positive planning policy framework that enables sustainable waste-related development, this will have an acceptable impact on local and global environmental quality.

The Municipal Waste Management Strategy for Devon (2008) sets out waste reduction targets to be reviewed every 5 years including:

- municipal recycling/ composting rates – 40% by 2009/10;
- reduce the growth of household waste to 1% by 2009/10;
- emphasise waste as a resource; and
- encourage recovery, diversion of biodegradable, recycling and composting waste programs.

Plymouth's ***Municipal Waste Management Strategy 2007-2030 (2007)*** is intended as a guiding document for the future management of waste within Plymouth, and sets out 'how' waste will be managed over the period 2007 - 2030.

In the ***Plymouth Climate Change Waste Management Strategy 2007-2030*** are the objectives to:

- allocate land to enable the delivery of facilities which help Plymouth to meet its recycling and recovery targets;
- allocate land in a subsequent AAP or DPD for a recycling centre facility in the north of the city; and

- establish and implement an effective planning framework for the management of waste facilities .
- recycle or compost 33% of municipal waste by 2014/15.

Fife

Fife's Area Waste Plan (2006) sets out in detail the existing waste management infrastructure and arrangements, and develops the principles and plan or progress in waste management in the medium and long terms to meet current and future legislative requirements and the objectives of the National Waste Strategy, including development planning policy. It aims to ensure that the waste management system developed is in accordance with the best practicable environmental option (BPEO), which includes the principles of sustainable development and integrated waste management, and makes the maximum possible contribution to reducing society's environmental impact at an acceptable cost.

11.3 Overview of the Baseline

11.3.1 National

UK

Non-radioactive waste

In 2004, total UK non-radioactive waste arisings were around 335 million tonnes. Of this 32% was construction and demolition waste; 29% was mining and quarrying waste; 13% was industrial waste; 12% was commercial waste; 9% was household waste; 5% was dredging waste; and agricultural and sewage wastes made up for less than 1% each. Commercial and industrial waste arisings were therefore around 0.84 million tonnes in 2004. In 2007, 73 million tonnes of waste were sent to landfill (a decrease of 19.5% since 2002). The amount of waste recycled or composted has increased accounting for 34% of waste in 2007/08.[170]

In 2002, 41% of commercial and industrial waste arisings were landfilled; 33% were recycled; 9% were reused; 4% were treated; 4% were thermally treated; 4% were unrecorded; 3% went to land recovery; 2% were transferred; and 1% was unsampled.[171]

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[170] Defra, Sustainable Development Indicators in your Pocket 2009, http://www.defra.gov.uk/sustainable/government/progress/documents/SDIYP2009_a9.pdf

[171] Defra, edigest waste statistics, http://www.defra.gov.uk/environment/statistics/waste/wrindustry.htm

The total hazardous waste produced in UK in 2009 was 4,437,212 tonnes.[172]

Radioactive waste

Radioactive waste has three classifications; Low Level Waste (LLW), Intermediate Level Waste (ILW) and High Level Waste (HLW), the definitions of which are detailed below.

Low Level Waste (LLW)**:** LLW is defined as *w*aste that does not exceed specified levels of radioactivity (below 4 GBq/tonne of alpha or 12 GBq/tonne of beta-gamma activity). Overall, the major components of LLW are building rubble, soil and steel items such as framework, pipework and reinforcement from the dismantling and demolition of nuclear reactors and other nuclear facilities and the clean up of nuclear sites. However, at the present time most LLW is from the operation of nuclear facilities, and this is mainly paper, plastics and scrap metal items. About 93% (3,200,000m3) of radioactive waste falls into the LLW category. There are 3 LLW disposal sites within Great Britain.

Intermediate Level Waste (ILW): ILW is defined as wastes exceeding the upper boundaries for LLW that do not generate sufficient heat for this to be taken into account in the design of waste storage or disposal facilities. The major components of ILW are metal items such as nuclear fuel casing and nuclear reactor components, graphite from reactor cores, and sludges from the treatment of radioactive liquid effluents. ILW is stored in tanks, vaults and drums, with most waste requiring concrete to shield operators from the radiation. About 7% (about 240,000m3) of radioactive waste is in the ILW category.

High Level Waste (HLW): HLW is defined as wastes in which the temperature may rise significantly as a result of its radioactivity, so this factor has to be taken into account in the design of waste storage or disposal facilities. Initially HLW comprises nitric acid solutions containing the waste products of reprocessing spent nuclear fuels. HLW is stored as liquid in water-cooled, stainless steel tanks or as vitrified glass blocks, and needs thick concrete walls to shield operators from the high radiation. Less than 0.1% (1,100m3) is in the HLW category. HLW does not include spent fuels or nuclear materials themselves; these are held in long-term storage and are not classified as wastes.

The total volume of radioactive waste from all sources in the UK was estimated to be 290,230m3 (total stocks of High Level Waste (HLW), Intermediate Level Waste (ILW) and Low Level Waste (LLW) at April

[172] Environment Agency 2009 Hazardous Waste Arisings figures, http://www.environment-agency.gov.uk/static/documents/Research/EWHaz09_Final.xls

2007). Radioactive waste is classified by the level of radioactivity of the material. LLW accounts for 93% of UK arisings, ILW for 7% of UK arisings and HLW for <0.05% of UK arisings.[173]

Radioactive waste is managed on 36 sites in the UK, the majority of which are in England, including & sites owned by the MOD. There are three LLW disposal sites within Great Britain; the main national repository is the LLW Depository near Drigg, in England. Further LLW disposal sites are at Dounreay and Clifton Marsh.

At present there are no facilities in the UK for disposing of LLW not suitable for near-surface disposal, ILW and HLW – and these wastes are currently stored. 2 Managing Radioactive Waste Safely (MRWS) is the process to identify and implement long-term management solutions for the UK's higher-activity radioactive waste. As part of the MRWS programme the Government set up the independent Committee on Radioactive Waste Management (CoRWM). In 2006, CoRWM recommended that geological disposal, coupled with a programme of robust, safe and secure interim storage until a disposal facility is available, would be the best approach for managing the UK's inventory of legacy higher activity radioactive waste. In 2007 CoRWM was reconstituted to provide independent scrutiny on the Government's and Nuclear Decommissioning Authority's (NDA) proposals, plans and programmes to deliver geological disposal, together with robust interim storage, as the long-term management option for the UK's higher activity wastes. In June 2008, UK Government, in conjunction with the devolved administrations for Wales and Northern Ireland (not Scotland), published a White Paper setting out the framework for managing higher-activity radioactive waste in the long-term through geological disposal, coupled with safe and secure interim storage and ongoing research and development to support its optimised implementation.[174]

England

Non-radioactive waste

In 2004, total non-radioactive waste arisings in England were around 272,000,000 tonnes. Of this 32% was construction and demolition waste; 30% was mining and quarrying waste; 13% was industrial waste; 11% was commercial waste; 9% was household waste; 5% was dredged material; and agricultural and sewage wastes made up for less than 1% each.[175] In 2007, 73,000,000 tonnes of waste (household,

[173] The 2007 UK Radioactive Waste Inventory NDA,
http://www.nda.gov.uk/ukinventory/summaries/index.cfm

[174] BERR,
http://www.berr.gov.uk/energy/sources/nuclear/keyissues/ waste/mrws/page47832.html

[175] Waste Strategy for England 2007, Defra,
http://www.defra.gov.uk/environment/waste/strategy/strategy07/documents/waste07-strategy.pdf

commerce & industry, and construction & demolition) was sent to landfill (a decrease of 19.5% since 2002).[170]

Commercial and industrial waste arisings in England were estimated to be around 67,900.000 tonnes in 2002/2003. At that time, 41% of commercial and industrial waste arisings were landfilled; 33% were recycled; 9% were reused; 4% were thermally treated; and 2% was recovered by other means.[176]

The total hazardous waste produced in England in 2009 was 4,095,477 tonnes.[177]

Radioactive waste

The majority of radioactive waste in the UK is in England. There are 26 sites that manage radioactive waste in England, including 7 sites owned by the MOD. The main national repository is the LLW Repository near Drigg, in England.

Scotland

Non-radioactive waste

In 2008, waste arisings in Scotland totalled 19,515,392 tonnes (controlled waste arisings). Of this, 15% was household waste; 41% was commercial & industrial waste; and 44% was construction & demolition waste. A total of 6,112,198 tonnes of Scottish waste was sent to landfill in 2008 (a decrease of 1,221,240 tonnes since 2007). [178]

Commercial and industrial waste arisings in Scotland were estimated to be around 7,945,915 tonnes in 2008. Of a recorded 4,873,501 tonnes of commercial and industrial waste, 46% of this waste was landfilled; 5% was incinerated; 46% was recycled; and 3% was composted.

In 2009, 104,001 tonnes of hazardous waste was produced in Scotland.[179]

Radioactive waste

Radioactive waste is managed at 7 sites in Scotland, which includes the MOD sites at HMNB Clyde,

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[176] Commercial and Industrial Waste in England: Statement of aims and actions 2009, Defra, October 2009, http://www.defra.gov.uk/environment/waste/topics/documents/commercial-industrial-wasteaims-actions-091013.pdf
[177] Environment Agency 2009 Hazardous Waste Arisings figures, http://www.environment-agency.gov.uk/static/documents/Research/EWHaz09_Final.xls
[178] Scottish Government Higher Activity Waste Policy http://www.scotland.gov.uk/Topics/Environment/waste-and-pollution/Waste-1/16293/higheractivitywastepolicy
[179] Environment Agency 2009 Hazardous Waste Arisings figures, http://www.environment-agency.gov.uk/static/documents/Research/EWHaz09_Final.xls

Rosyth and Vulcan support the UK's naval nuclear propulsion programme.[180] A contract is expected to be awarded for the development of a new LLW disposal facility at Dounreay in 2011.[181]

The total predicted volume of radioactive waste from all sources in Scotland is estimated to be 429,500m^3 (lifetime total once all LLW and ILW are packaged. 90% of radioactive waste arisings in Scotland is LLW and 10% is ILW. No HLW is managed in Scotland.[182]

At present there are no facilities in Scotland for disposing of LLW and ILW - these wastes are currently stored. The Scottish Government currently supports long-term interim storage of radioactive waste and therefore did not sponsor the MRWS White Paper. The Scottish Government is currently developing a detailed policy statement intended to enable waste producers to manage radioactive wastes arising from nuclear sites in Scotland.[183]

Wales

Non-radioactive waste

In 2008, non-radioactive waste arisings in Wales totalled 7,200,000 tonnes. At that time, a total of 2,968,000 tonnes of waste was sent to landfill (a decrease of 1,409,000 tonnes since 1998/1999).[184]

Commercial and industrial waste arisings in Wales were estimated to be around 3,573,000 tonnes in 2007. At that time, 49% of commercial and industrial waste was recycled, composted or reused; 1% was incinerated; and 39% was landfilled.[185]

In 2009, 209,701 tonnes of hazardous waste was produced in Wales.[186]

Radioactive waste

Radioactive waste is managed at 3 sites in Wales, the NDA Magnox reactor station sites at Trawsfynydd and Wylfa – the former is shut down and being decommissioned, the latter is operational; and GE Healthcare's Maynard Centre at Cardiff.

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[180] The 2007 UK Radioactive Waste Inventory NDA, http://www.nda.gov.uk/ukinventory/summaries/index.cfm
[181] Commercial and Industrial Waste in England: Statement of aims and actions 2009, Defra, October 2009 http://www.defra.gov.uk/environment/waste/topics/documents/commercial-industrial-waste-aims-actions-091013.pdf
[182] The 2007 UK Radioactive Waste Inventory NDA, http://www.nda.gov.uk/ukinventory/summaries/index.cfm
[183] New Low Level Waste Facilities, Dounreay Site Restoration Limited ,http://www.dounreay.com/waste/radioactive-waste/low-level-waste/new-low-level-waste-facilities
[184] Scotland's Zero Waste Plan, Scottish Government, 2010 http://www.scotland.gov.uk/Resource/Doc/314168/0099749.pdf
[185] Wales Waste Information 2008, Environment Agency, http://www.environment-agency.gov.uk/research/library/data/111408.aspx
[186] Environment Agency 2009 Hazardous Waste Arisings figures, http://www.environment-agency.gov.uk/static/documents/Research/EWHaz09_Final.xls

The total predicted volume of radioactive waste from all sources in Wales is estimated to be 125,900m^3 (lifetime total once all LLW and ILW are packaged. Approximately 83% of radioactive waste arisings in Wales is LLW and 17% is ILW). No HLW is managed in Wales.

At present there are no facilities in Wales for disposing of LLW and ILW – these wastes are currently stored and transported to the respository in Drigg, England.[187] The Welsh Assembly Government support CoRWM recommendations that geological disposal, preceded by safe and secure interim storage, is the best approach for the long-term management of higher activity radioactive wastes.

Northern Ireland

Non-radioactive waste

Non-radioactive waste arisings in Northern Ireland totalled 1,063,510 tonnes in 2006/7.

Total commercial and industrial waste arisings for Northern Ireland in 2004/05 were estimated to be around 1,560,371 tonnes.

A large proportion of commercial and industrial waste is suitable for recycling and recovery, however historically this material has been disposed of to landfill. The amount of commercial and industrial waste estimated to have been landfilled in 2004/05 was 64% (equivalent to 998,200 tonnes). In 2004/05 24% of commercial and industrial waste produced (equivalent to 379,817 tonnes) was recycled.[188]

Radioactive waste

There are currently no nuclear licensed sites in Northern Ireland as only very small quantities of radioactive waste are produced from hospitals and industry.

There are no major radioactive waste producer sites in Northern Ireland. The Department of the Environment Northern Ireland supports CoRWM recommendations that geological disposal, preceded by safe and secure interim storage, is the best approach for the long-term management of higher activity radioactive wastes.

[187] BERR, http://www.berr.gov.uk/energy/sources/nuclear/key-issues/waste/mrws/page47832.html
[188] Commercial and Industrial Waste Arisings Survey 2004/05, Environment and Heritage Service, March 2007, http://www.ni-environment.gov.uk/cijustreport.pdf

11.3.2 Sub-regional locations

Plymouth

The waste management facilities in Plymouth include; 60 ‘bring’ bank sites; 2 Civic Amenity Recycling Centres (CARCs), 1 Materials Recovery Facility (MRF); 1 composting facility.[189] The Chelson Meadow landfill site closed in 2008 and waste is now taken to a transfer station at Chelson Meadow to be bulked up before being transported by lorry to Lean Quarry at Lean Quarry near Liskeard. This is an interim arrangement until a new partnership waste solution is in place, which is likely to be around 2014. [189]

In 2011 the South West Devon Waste Partnership selected MVV Umwelt as the preferred bidder for the provision of a solution to treat the partnership’s residual waste. MVV Umwelt is proposing an energy from waste facility at North Yard, HM Naval Base Devonport, which is in the Weston Mill area of the Naval Base bordering Blackies Wood. Provided planning approval is granted, the intention is to commence construction in 2012 with a view to commencing operations in 2014.[190]

In 2005 the annual commercial waste arisings were estimated at being between 173,000 and 199,000 tonnes. [191]

In 2001 134,710 tonnes of commercial waste were managed in Plymouth. 39% of commercial and industrial waste underwent biological treatment; 36% was landfilled; 18% underwent materials recovery; and 7% was composted. These values exclude waste handled at waste transfer stations (45,200 tonnes in 2001-01).[192]

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[189] Plymouth City Council, Municipal Waste Management Strategy 2007-2030, Baseline Report - Where we are today, April 2007, http://www.plymouth.gov.uk/supplementary_report_1_-_baseline_report_final.pdf

[190] South West Devon Waste Partnership, http://www.plymouth.gov.uk/homepage/environmentandplanning/rubbishandrecycling/jointwastepartnership/swdwp/swdwpnewsevents/swdwplocalsituation.htm

[191] Entec UK (January 2007). Plymouth Waste Local Development Document: Future Waste Requirements (Update) http://www.plymouth.gov.uk/future_waste_management_requirements_jan_2007.pdf

[192] Entec UK (July 2005) Future Waste Requirements, http://www.plymouth.gov.uk/homepage/environmentandplanning/planning/planningpolicy/ldf/ldfbackgroundreports/brfuturewasterequirementsjuly2005.htm

Fife

The waste management facilities in Fife include; two landfill sites; 11 recycling centres; around 350 recycling points; one main composting site; two private company composting sites, one biomass incinerator; and one co-incineration plant.[193]

422,919 tonnes of commercial and industrial waste were produced in 2006-07[194]. Of the municipal fraction (28,117 tonnes), 12% was recycled, 0% was composted and 88% was landfilled).[194]

There were 52 waste management sites in Fife that were actively receiving waste in 2006. The total annual capacity of all licensed/permitted sites (except incinerators and other thermal treatment plants) operational in 2006 was 2,968,730 tonnes.

Within a 15km radius of Rosyth, there are 6 waste transfer stations, 1 landfill site, 3 multiple activity sites, 1 pet cemetery/crematorium, 1 civic amenity/recycling centre, 1 aerobic digestion site and 3 metal recycling sites.[195]

11.4 Existing problems

11.4.1 National

UK

Non-radioactive waste

Although reuse and recycling rates for industrial wastes are increasing, due to the combined effects of statutory, reputational and financial drivers, there are still high levels of waste being disposed of, with limited opportunity for recycling hazardous and very low-level radioactive materials. There is pressure to achieving as close to zero landfill as possible throughout the UK.[196, 197]

Commercial and industrial waste data is not routinely collated (Defra intend to carry out a national survey of commercial and industrial waste by the end of 2010). However it is subject to similar pressures as

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[193] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1. And SEPA, Fife Strategic Waste Management Review, 2008, www.sepa.org.uk/waste/waste_data/waste_data_reports/idoc.ashx?docid=502f5d8e-599a-4924-87cb-d3c6f9d96af1&version=-1 - 30 Nov 2008 - 1255k – Preview
[194] SEPA, 2006-07 waste data, http://www.sepa.org.uk/waste/waste_data/waste_data_reports/waste_management_reviews.aspx
[195] SEPA, Waste management facilities in Fife http://www.sepa.org.uk/waste/waste_infrastructure_maps/local_authority_maps.aspx.
[196] Wales Waste Information 2008, Environment Agency, http://www.environment-agency.gov.uk/research/library/data/111408.aspx
[197] Scotland's Zero Waste Plan Data, Scottish Environment Protection Agency, June 2010, http://www.sepa.org.uk/waste/waste_data/zero_waste_plan_data.aspx

municipal waste, namely increased waste prevention, adoption of recycling and reuse alternatives and reduced reliance on landfill.

Radioactive waste

In 2007, defence accounted for 2% of UK total radiological waste arisings. The SDP will, however, add to the accumulating ILW and LLW in the UK that will need to be disposed of.

There is currently no centralised UK higher-activity radioactive waste storage capacity. Intermediate level waste (ILW) is generally stored at or close to the point of generation, whilst spent fuels are stored at Sellafield. The delivery of a National Geological Disposal Facility is being planned, with a current in service date of around 2040. However, this date is not guaranteed, so ILW may have to be stored for longer than this; a design life of 100 years has been adopted for the interim storage solution.

11.4.2 Sub-regional locations

Each sub-regional baseline records an increase in the quantities of waste arising along with significant increases in recycling rates. Limited landfill capacity is also noted as a critical future issue.

11.5 Likely evolution of the baseline

11.5.1 National

UK

Non-radioactive waste

Non-radioactive waste management in the UK is moving towards greater reuse and recycling and less landfill. Between 2002 and 2007 in the UK, there was 19.5% decrease in waste disposed of in landfill sites. This includes waste produced by households, commerce and industry and construction and demolition.[198]

Hazardous waste production in England and Wales has decreased since 2004 by 17%. The majority of the decrease is due to the reduction in liquid inputs to one treatment facility on Teesside in 2009.[199]

MOD targets for waste include to;

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[198] Waste Strategy for England 2007, Defra

[199] Environment Agency Waste Trends, http://www.environment-agency.gov.uk/research/library/data/123472.aspx

- reduce total waste arisings by 5%, by March 2011, and by 25% by 2020 relative to the 2004/05 baseline (SOGE target) and;
- increase recycling levels to be at 40% of the baseline by March 2011, and to 75% by 2020 (SOGE target). [200, 201]

Radioactive waste

There is currently a trend of increasing volumes of low level radioactive waste generated in the UK, predominantly due to dismantling of decommissioned nuclear sites. This trend for existing waste is not expected to be sustained into the long term as 95% of the total projected nuclear waste arisings for the next century have already been produced (excluding arisings from planned new build nuclear power stations).[202]

NDA radioactive waste projections for the UK (excluding new build nuclear power stations) are set out below in Table 11.1. [203]

Table 11.1 NDA waste projections for the UK

Waste Type	Volume (cubic metre) stocks at 1st April 2007	Estimated future arisings[1]	Lifetime once all wastes are packaged
HLW	1,730	-646[2]	1,420
ILW	92,500	143,000	364,000
LLW	196,000	3,000,000	3,470,000

[1] These figures assume no new nuclear power stations. There are not currently projections which include new nuclear power station arisings.

[2]Future arisings of HLW have negative volumes. This is because Sellafield has reported future arisings of HLW to show that the volume of accumulated waste (liquid plus vitrified product) will fall as liquid waste existing at 1 April 2007 and forecast in the future is conditioned to a vitrified product

Plans for a new generation of nuclear power stations in the UK are likely to result in increased radiological waste arisings in the future. As yet the volumes of waste have not been quantified. However disposal is expected to be met nationally, with appropriate capacity planned into deep geological disposal infrastructure.[204]

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[200] MOD, Sustainable Development Report and Action Plan, 2008, http://www.mod.uk/NR/rdonlyres/D8407A1C-CA68-4AD4-8E17-9F71B151AF6A/0/SusDevReport2008.pdf

[201] MOD, Sustainable Development Report and Action Plan, 2009, http://www.mod.uk/NR/rdonlyres/F9E34976-9E39-4E0D-BADA-157975DF2118/0/stewardshiprpt200809v7.pdf

[202] NDA (2008) The 2007 UK Radioactive Waste Inventory,

[203] NDA (2008) The 2007 UK Radioactive Waste Inventory,

[204] Meeting the Energy Challenge, A White Paper on Nuclear Power, BERR, January 2008,

England

Non-radioactive waste

In England, the total amount of non-radioactive waste sent to landfill has decreased from 80,000,000 tonnes annually in 2000/01 to 72, 500,000 tonnes in 2004/05 at licenced landfill sites: with falls from 50% to 44% for industrial and commercial waste between 1998/99 and 2002/03.4 Between 1998/99 and 2002/03 there was a 1% reduction in the total amount (in tonnes) of commercial and industrial waste produced in England. Within this total, industrial waste had reduced to 38,000,000 tonnes in 2002/3 while the amount of commercial waste had grown to 30,000,000 tonnes. During this period, the tonnage of commercial and industrial waste sent to landfill has decreased, with more waste handled by transfer stations and treatment facilities.[205] In 2002/3 for the first time, recycling and reuse had overtaken landfill as the most common method of waste management. Overall 44% was sent to landfill and 45% recycled.

Defra has established targets for England which includes a greater focus on waste prevention seeking to achieve a fall of 50% per person of household waste arising. Recycling and composting of household waste targets have been established - at least 40% by 2010, 45% by 2015 and 50% by 2020; and recovery of municipal waste - 53% by 2010, 67% by 2015 and 75% by 2020.[206]

On the basis of the policies set out in Waste Strategy for England 2007, levels of commercial and industrial waste landfilled are expected to fall by 20% by 2010 compared to 2004. The Government is considering, in conjunction with the construction industry, a target to halve the amount of construction, demolition and excavation wastes going to landfill by 2012.

Radioactive waste

NDA radioactive waste projections for England (excluding new build nuclear power stations) are set out in Table 11.2. [207]

Table 11.2 NDA waste projections for England

Waste Type	Volume (cubic metre) stocks at 1st April 2007	Estimated future arisings[1]	Lifetime once all wastes are packaged
HLW	1,730	-646[2]	1,420
ILW	80,700	112,000	298,000

http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk//energy/nuclearwhitepaper/page42765.html).
[205] Commercial and Industrial Waste in England: Statement of aims and actions 2009, Defra, October 2009, http://www.defra.gov.uk/environ ment/waste/topics/documents/commercial-industrial-waste-aimsactions-091013.pdf
[206] Waste Strategy for England 2007, Defra
[207] NDA (2008) The 2007 UK Radioactive Waste Inventory,

Waste Type	Volume (cubic metre) stocks at 1st April 2007	Estimated future arisings[1]	Lifetime once all wastes are packaged
LLW	186,000	2,670,000	2,980,000

[1] These figures assume no new nuclear power stations. There are not currently projections which include new nuclear power station arisings.

[2]Future arisings of HLW have negative volumes. This is because Sellafield has reported future arisings of HLW to show that the volume of accumulated waste (liquid plus vitrified product) will fall as liquid waste existing at 1 April 2007 and forecast in the future is conditioned to a vitrified product

Scotland

Non-radioactive waste

In Scotland, total non-radioactive waste arisings increased by 1,483,444 tonnes between 2004 and 2008. During the same period, however, commercial and industrial waste arisings decreased. The total amount of Scottish Waste sent to landfill decreased from 7,814,879 tonnes to 6,112,198 tonnes over the same five year period.[208]

The quantity of hazardous waste in Scotland reduced from 109,995 tonnes in 2006 to 104,001 tonnes in 2009, a decrease of 5.4%.[209]

Under the 'Zero Waste Plan', the Scottish Government has set a long term target of 70% recycling/composting and preparing for reuse of all waste arising in Scotland by 2025, regardless of its source. The Scottish Government has also set a target of no more than 5% of all waste produced to go to landfill by 2025.[210]

Radioactive waste

NDA radioactive waste projections for Scotland (excluding new build nuclear power stations) are set out in Table 11.3. [211]

[208] Scotland's Zero Waste Plan Data, Scottish Environment Protection Agency, June 2010, http://www.sepa.org.uk/waste/waste_data/zero_waste_plan_data.aspx
[209] Environment Agency Waste Trends, http://www.environment-agency.gov.uk/research/library/data/123472.aspx
[210] Scotland's Zero Waste Plan Data, Scottish Environment Protection Agency, June 2010, http://www.sepa.org.uk/waste/waste_data/zero_waste_plan_data.aspx
[211] NDA (2008) The 2007 UK Radioactive Waste Inventory,

Table 11.3 NDA waste projections for Scotland

Waste Type[1]	Volume (cubic metre) stocks at 1st April 2007	Estimated future arisings	Lifetime once all wastes are packaged
ILW	80,670	117,400	44,500
LLW	9,480	240,000	385,000

[1] No HLW is managed in Scotland.

Wales

Non-radioactive waste

In Wales, the landfilling of all wastes has decreased by 1,409,000 tonnes between 1998/99 (4,377,000 tonnes) and 2007 (2,968,000 tonnes).[212] Commercial and industrial waste arisings rose slightly in 2007 when compared to the previous year, which reflects the increase in commercial waste production between 2002/03 and 2007 (and may also in part due to inaccuracies in monitoring. However, commercial and industrial arisings have decreased by 13% overall since 1998/99. The amount of commercial and industrial waste disposed of to landfill also continues to reduce; the amount of waste landfilled in 2007 was 57% of the 1998/99 figure.

Industrial waste arisings during the period 2010/11 to 2013/14 are predicted to remain relatively static in Wales, due to likely future decoupling between economic growth and waste growth because of regulatory and economic measures and cultural factors, and the decline, and likely further decline, in the industrial/manufacturing sector in Wales. During the same period, although there is expected to be continued growth in the commercial sector, commercial waste arisings are expected to remain static as further waste reduction/prevention measures are implemented.

Towards Zero Waste' the Waste Strategy for Wales, sets the following targets for commercial and industrial waste:

- to achieve a reduction in commercial and industrial waste produced equivalent to at least 10% of the 1998 arisings by 2010;
- to reduce the amount of commercial and industrial waste sent to landfill to less than 80% of that landfilled in 1998/99 by 2010; and

[212] Towards Zero Waste: and Waste Strategy Progress Report 2002- 2008, Welsh Government, June 2010, http://wales.gov.uk/docs/desh/publications/100730wasteprogressen.pdf

- to reduce the amount of biodegradable commercial and industrial waste sent to landfill to less than 80% of that landfilled in 1998/99 by 2010.[213]

Radioactive waste

NDA radioactive waste projections for Wales (excluding new build nuclear power stations) are set out below in Table 11.4.[214]

Table 11.4 NDA waste projections for Wales

Waste Type[1]	Volume (cubic metre) stocks at 1st April 2007	Estimated future arisings	Lifetime once all wastes are packaged
ILW	3,100	13,900	21,900
LLW	697	83,400	104,000

[1] No HLW is managed in Wales

Northern Ireland

Non-radioactive waste

In Northern Ireland, waste production is expected to continue to increase due to economic and population growth. Although, increased reuse, recycling and recovery of waste, and diversion of waste from landfill is expected to continue to increase as waste reduction/prevention measures continue to be implemented.[215]

The 2004/05 Commercial and Industrial Waste Arisings Survey reports an increase in commercial and industrial waste arisings from the previous years (estimated to be around 1,560,371 tonnes). However, it is difficult to draw direct comparisons due to the differences in data collection methods.[216]

There have also been increases in the proportion of commercial and industrial waste Landfilled in Northern Ireland; 64% of waste was landfilled in 2004/05, compared to 40% and 41% in 2000 and 2002 respectively.[216]

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[213] Towards Zero Waste: and Waste Strategy Progress Report 2002-2008, Welsh Government, June 2010, http://wales.gov.uk/docs/desh/publications/100730wasteprogressen.pdf
[214] NDA (2008) The 2007 UK Radioactive Waste Inventory,
[215] 'Our Environment, Our Heritage, Our Future' State of the Environment Report for Northern Ireland, Department of the Environment, March 2008
http://www.nienvironment.gov.uk/index/aboutniea/state_of_the_environment/state_of_the_environment_report.htm
[216] Commercial and Industrial Waste Arisings Survey 2004/05, Environment and Heritage Service, March 2007, http://www.nienvironment.gov.uk/cijustreport.pdf

The quantity in Northern Ireland reduced from 19,447 in 2006 tonnes to 10,773 tonnes in 2009, a decrease of 44.6%.[217]

'Towards Waste Management', the Northern Ireland Waste Management Strategy for 2006 to 2020, sets the following targets:

- 60% of Commercial and industrial waste to be recycled by 2020;
- 75% of Construction, demolition and excavation Wastes to be recycled or reused by 2020; and
- recycling and composting of household wastes to be at: 35% by 2010; 40% by 2015; and 45% by 2020.[218]

Radioactive waste

There are currently no nuclear licensed sites in Northern Ireland, with only very small quantities of radioactive waste produced from hospitals and industry. However, any new nuclear development in Northern Ireland would increase radiological waste arisings in the future.

11.5.2 Sub-regional locations

Plymouth

Commercial and industrial waste arisings are predicted to rise to between 140,000 and 334,000 by 2026 depending on the areas growth rate.[219] The Waste Strategy for the South West Region requires that by 2021 Plymouth recycle or recover 83% of industrial and commercial wastes.[219] Commercial and industrial waste management will require an additional 55,000 to 120,000 tonnes of recycling and composting capacity by 2021 as well as an additional 65,000 tonnes of recovery capacity.[219]

The Waste Strategy for the South West Region requires that by 2021 Plymouth recycle or recover 83% of industrial and commercial wastes: [219]

- By 2021 Plymouth will require between about 65,000 tonnes and 130,000 tonnes of recycling and composting capacity for industrial and commercial waste. This will increase to between

[217] Environment Agency Waste Trends, http://www.environment-agency.gov.uk/research/library/data/123472.aspx
[218] Towards Resource Management: The Northern Ireland Waste Management Strategy 2006-2020, Department of the Environment Northern Ireland, 2006, http://www.ni-environment.gov.uk/wms.17.pdf
[219] Entec UK (January 2007). Plymouth Waste Local Development Document: Future Waste Requirements (Update) http://www.plymouth.gov.uk/future_waste_management_requirements_jan_2007.pdf

62,000 tonnes and 147,000 tonnes by 2026. This means that an additional 55,000 to 120,000 tonnes of recycling and composting capacity is required by 2021 for commercial and industrial waste.

- By 2021 Plymouth will require between about 57,000 tonnes and 115,000 tonnes of further recovery capacity for industrial and commercial waste will be required in Plymouth. This will change to between 55,000 tonnes and 130,000 tonnes by 2026. This means that an additional 65,000 tonnes of industrial and commercial recovery capacity is required in Plymouth over by 2021.

- Between 40 000 and 96 000 tonnes of industrial and commercial waste will be sent to landfill every year by 2026.

- Annual commercial waste arisings were estimated at being between 173,000 and 199,000 tonnes in 2005. Commercial and industrial waste arisings are predicted to rise to between 140,000 and 334,000 by 2026 depending on the areas growth rate.

In Plymouth there is a trend of an increasing percentage of household waste being recycled or composted and a decline in the percentage of waste landfilled. [220]

Fife

There is a trend towards more sustainable waste management. It is likely that policy requirements will drive greater proportions of waste management towards reuse and recycling and away from landfill. [221]

As of 2008 Fife had four active landfills, Lochhead landfill, Valley Ash Lagoons, Longannet Point Ash Lagoons and Lower Melville Wood. The remaining capacities were 2,920,702, 7,528,000, 100,000 and 265,875 tonnes respectively (Valley Ash and Longannet are not included in the report due to being for in-house waste only).[222]

Targets are to conform to the objectives of Scotland's National Waste Plan:

- provide widespread segregated kerbside waste collections across Scotland (to over 90% of households by 2020);

- aim to stop growth in the amount of municipal waste produced by 2010;

[220] Plymouth's Sustainable Community Strategy 2007-2020, http://www.plymouth.gov.uk/homepage/communityandliving/plymouth2020/lspcurrentdocuments/lspsustainablecommunitystrategy.htm
[221] Fife Council, Fife Structure Plan SEA 2008, http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/dev-plan/FifeSP/FifeSEAreport
[222] SEPA, Landfill Capacity Report for Scotland, 2008

- achieve 25% recycling and composting of municipal waste by 2006, and 55% by 2020 (35% recycling and 20% composting);
- recover energy from 14% of municipal waste;
- and reduce landfilling of municipal waste from around 90% to 30%.[223]

11.6 Assessment objective, guide questions and significance

The objective and guide questions related to cultural heritage that have been used in the assessment of the effects of the SDP are set out in Table 11.5, together with reasons for their selection.

Table 11.5 Approach to assessing the effects of SDP on waste management

Objective/guide question	Reasoning
Objective: to minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities	The Waste Framework Directive promotes a hierarchical approach to waste management which is reflected in national strategy, such as the Waste Strategy for England. SDP proposals should seek to accord with these principles and, consequently, the effects on waste management should be taken into account in the Environmental Report.
Will the SDP Proposals increase the amount of radioactive waste to be disposed of?	Radioactive wastes have the potential to impact on environment and health if not handled and disposed of correctly. Preventing radioactive waste generation .will decrease this risk.
Will the SDP Proposals affect the amount of hazardous waste to be disposed of?	The Basel Convention promotes minimisation of generation of quantities of hazardous waste in order to prevent against problems and challenges posed by hazardous waste.
Will the SDP Proposals affect the amount of non-hazardous wastes produced?	The Waste Framework Directive promotes a hierarchical approach to waste management with waste prevention at the top of the hierarchy. This is supported through national strategies such as Waste Strategy for England, Scotland's Zero Waste Plan and Towards Zero Waste, One Wales: One Planet.
Will the SDP Proposals affect the capacity of existing waste management systems, both nationally and locally?	The capacity of landfill sites is diminishing and European legislation, in particular the Landfill Directive, means that other options need to be considered to manage the volume of waste we generate, such as recycling.

[223] Scottish Government, Scotland National Waste Plan

Objective/guide question	Reasoning
Will the SDP Proposals maximise re-use and recycling of recovered components and materials?	Recovering and recycling waste will assist in decreasing the amount of waste to landfill. The Landfill Directive aims to reduce amount of biodegradable waste going to landfill to 35% of the 1995 figures by 2020. National strategies such as Waste Strategy for England, Scotland's Zero Waste Plan and Towards Zero Waste, One Wales: One Planet also include targets for recycling rates.
Will the SDP Proposals help achieve government and national targets for minimising, recovering and recycling waste?	Minimising, recovering and recycling waste will assist in decreasing the amount of waste to landfill. The Landfill Directive aims to reduce amount of biodegradable waste going to landfill to 35% of the 1995 figures by 2020. This is supported through national strategies such as Waste Strategy for England, Scotland's Zero Waste Plan and Towards Zero Waste, One Wales: One Planet.
Will the SDP Proposals affect the environmental risks associated with managing radioactive and hazardous wastes?	Radioactive and hazardous wastes have the potential to negatively impact on environment if not handled and disposed of correctly. Regulations, such as Ionising Radiations Regulations and national strategies such as the UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry Strategy provide frameworks for the safe disposal and storage of radioactive wastes. The Basel Convention and national strategies such as Strategy for Hazardous Waste Management in England set out principles for safe disposal of hazardous wastes.

Table 11.6 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the waste management objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 11.6 Approach to determining the significance of effects on waste management

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option will increase capacity of waste management infrastructure. • Option would create no additional hazardous or non-recyclable waste, whilst maximising the proportion of materials that are re-useable or recyclable. • Option will ensure the safe handling of radioactive and hazardous wastes.
+	Positive	• Option would not create an increase in the volume of hazardous and non-recyclable wastes that require disposal. • Option would increase the volume of materials reused and recycled. • Option will ensure the safe handling of radioactive and hazardous wastes.
0	No (neutral effects)	• Option would not create an increase in the volume of hazardous and non-recyclable wastes that require disposal. • Option will have no effect on the capacity of waste management infrastructure.

Effect	Description	Illustrative Guidance
-	Negative	• Option will result in an increase in radioactive waste for disposal. • Option will increase volumes of hazardous and non-recyclable waste that would require disposal. • Option may have a limited adverse impact on the capacity of existing waste management systems.
--	Significant negative	• Option will generate high volumes of radioactive waste for disposal. • Option will generate a high volume of hazardous and non-recyclable waste that would require disposal. • Option will impede the achievement of government and national targets for minimising, recovering and recycling waste. • Option will have a significant adverse impact on the capacity of existing waste management systems (e.g. leading to the permitting of additional landfill capacity to accommodate waste). • Option may increase risks associated with the handling of radioactive and hazardous wastes.
?	Uncertain	• From the level of information available the effects the impact that the option would have on this objective is uncertain.

11.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the waste management objective. **Table 11.7** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 11.7 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 11.8** below.

Table 11.8 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than 'greenfield' sites, although it is recognised that 'brownfield' land can be important for

Category	Assumption Description
	conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m^2. Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2 . As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average). • It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine

Category	Assumption Description
	• It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW ‘up front’ is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be ‘broken’ and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are ‘broken’ and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since breaking a cleared submarine is little different to breaking a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC’s weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be transported from the initial dismantling facility to the interim storage facility by sea, rail or

Category	Assumption Description
	road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a ‘brownfield’ site or and ‘existing’ Licensed or Authorised site.

Each of the stages described in **Table 11.7** are considered in-turn below.

Stage I: Designing and Developing Initial Submarine Dismantling Facilities

Materials Assets (Waste Management)

Option 1: Develop a Greenfield Site for Submarine Dismantling

Assessment of Effects:

The construction of dismantling and size reduction facilities and ancillary infrastructure on a greenfield site could generate large amounts of construction wastes. The key primary waste materials would be aggregates of varying size and composition, soil and spoil. Aggregates may come from any excavated or dredged material given the anticipated requirement for deepwater access to a proposed facility.

Secondary wastes arising from construction activities would include:

- concrete, gypsum and other rendering materials;
- water from dust prevention and any surface runoff;
- woods and metals;
- packaging (blown foam, plastic ties, metal ties, wooden crates, pallets).

Tertiary wastes could include broken bricks/blocks, nails/bolts, worn tools, canisters, drums (e.g. fuel, diesel, chemicals) and food waste and food packaging from on site food consumption.

Depending on their type, wastes may be sent to landfill, recycled or re-used, for example, as landscaping or as aggregates for construction projects. Some of the waste may be treated as hazardous waste and would need to be handled in compliance with relevant waste regulations.

It would be expected that the majority of the primary wastes arising could be reused or recycled, although in the case of the dredged material it will depend on sediment type. Recovery, reuse and recycling of secondary and tertiary materials may place additional pressure on local and county wide waste management practices and facilities.

It is anticipated that a residual amount of waste will enter the waste cycle that will require disposal.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities and infrastructure (e.g. roads, car parking, security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale of construction would be reduced under RC/RPV storage options in the short term, it is expected that there would also be a reduction in waste arisings relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further arisings would be generated in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep waste volumes below thresholds where they would increase pressure on local and county wide waste management practices and facilities.

Proposed Mitigation / Enhancements Measures:

- Waste minimisation and management best practices should be implemented, with a focus on materials resource efficiency (using less and re-using more), in accordance with WRAP guidance, Delivering Effective Waste Minimisation and Delivering Good Practice Waste Management.
- Materials usage and waste should be considered early in the design process and opportunities to 'design out waste' should be considered. This could involve: design with existing resources (taking account of resources available on site or close by); standardisation of building form, layout and materials; design for easy demolition, re-construction and adaptability; designing to material dimensions; use of made-to-measure materials; and the use of modern methods of construction (that eliminate or reduce the requirement for site cutting and handling of materials). This should involve early discussions between the client, designers, contractors and subcontractors to identify potential waste streams and their quantities. Guidance on waste minimisation through design is provided in the WRAP document, Achieving

Stage I: Designing and Developing Initial Submarine Dismantling Facilities Materials Assets (Waste Management)	
Effective Waste Minimisation through Design: Guidance on designing out waste for construction clients, design teams and contractors. • Consideration of offsite fabrication of building infrastructure to reduce on site waste streams where possible. • Best practice procedures for the protection, storage and handling of materials should be followed. A robust logistics plan should be developed, identifying how materials are to be moved to, from and on site and how they are stored. This could include just in time delivery or the use of consolidation centres to help reduce damage to materials and products by minimising the amount of time stored on site, and take back schemes for surplus material. • The potential for materials wastage should be reduced through effective procurement; producing accurate estimates of materials required, ordering the correct amount of materials at the correct time, developing partnerships with suppliers who can implement waste minimisation at source; and setting up schemes with suppliers to take back surplus materials. • Provision should be made for the segregation of wastes to enable a high level of recycling. Options for re-use of materials on site should be identified. Where re-use and recycling is not possible, options for disposal should be investigated to minimise environmental effects. • A waste minimisation strategy should be implemented as part of the Site Waste Management Plan (SWMP). As a minimum, the SWMP should contain detailed measures to comply with relevant waste legislation but should also include good practice guidance and objectives in order to maximise the reduction, reuse and recovery of waste, with disposal to landfill as the least preferred option. The waste minimisation strategy should identify where waste arises in design, procurement and logistics and set out clear mechanisms for achieving waste reduction. Further guidance on site waste management is provided in the Department of Trade and Industry document, Site Waste Management Plans, Guidance for Construction Contractors and Clients and supplementary guidance available from WRAP (www.wrap.org.uk/construction). • The appointment of trained, experienced and professional contractors would also be beneficial to reducing construction waste generation as they may work more efficiently than those with less experience. Training and educating site staff on how to reduce waste, and the appointment of contractors registered with the Considerate Constructors Scheme may also help to ensure the appropriate management of construction waste, who commit to best practice construction methods.	
Summary: Option 1 has been assessed as having a negative effect in relation to this objective due to the volume of construction wastes likely to arise from complete redevelopment and change of use of the greenfield site. Despite commitments to the reuse and recycling of wastes, some residual waste is anticipated to require disposal. Some of this residual waste may be treated as hazardous waste and would need to be handled in compliance with relevant waste regulations. For RC and RPV storage options construction of the size reduction facility would be delayed, reducing associated waste arisings. However, further arisings would be generated in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep waste volumes below thresholds where they would increase pressure on local and county wide waste management practices and facilities.	**-/--**
Option 2: Develop a Brownfield Site for Submarine Dismantling	
Assessment of Effects: The construction of SDP facilities on a brownfield site could generate large amounts of construction wastes, however as it is expected that the scale of construction will be less than that identified within Option 1 therefore reducing the scale of negative effects accordingly. The key primary waste materials would be aggregates of varying size and composition, soil and spoil. Aggregates may come from any excavated or dredged material given the anticipated requirement for deepwater access to a proposed facility. Secondary wastes arising from construction activities would include: • concrete, gypsum and other rendering materials;	

Stage I: Designing and Developing Initial Submarine Dismantling Facilities

Materials Assets (Waste Management)

- water from dust prevention and any surface runoff;
- woods and metals;
- packaging (blown foam, plastic ties, metal ties, wooden crates, pallets).

Tertiary wastes could include broken bricks/blocks, nails/bolts, worn tools, canisters, drums (e.g. fuel, diesel, chemicals) and food waste and food packaging from on site food consumption.

Depending on their type, wastes may be sent to landfill, recycled or re-used, for example, as landscaping or as aggregates for construction projects. Some of the waste may be treated as hazardous waste and would need to be handled in compliance with relevant waste regulations. It is anticipated that a residual amount of waste will enter the waste cycle that will require disposal.

It would be expected that the majority of the primary wastes arising could be reused or recycled, although in the case of the dredged material it will depend on sediment type. Recovery, reuse and recycling of secondary and tertiary materials may place additional pressure on local and county wide waste management practices and facilities, however as it is expected that the scale of construction will be less than that identified within Option 1 the volumes of waste arising will be commensurately less. It is further assumed that there will likely be requirement for some demolition of any disused or dilapidated buildings prior to construction which dependent on the scale of demolition required will affect the scale of waste arisings from the construction site requiring disposal. It is envisaged, however that there are likely to be numerous opportunities for reuse or recycling of recovered components and materials including infrastructure/buildings during the construction of the development of a dismantling facility due to the need for site reconfiguration. As a consequence, it is expected that there will be limited/no impact on the existing waste management systems either nationally or locally during construction due to the scale of infrastructure expected to be in situ.

Dredging is likely to feature within redevelopment of a brownfield site due to the requirement for deepwater access to the proposed facilities however it is expected that this would not be as great as within Option 1 due to the previous use of the site likely to also have required deepwater access.

A further consideration in relation to waste management is the extent to which the brownfield site may contain historical contamination from previous uses which will require remediation and or treatment and potential disposal. The likelihood of this on a brownfield is greater than that of a greenfield and may result in hazardous waste streams if located. Even so it has been assumed that site development would not proceed on a site which had not previously been deemed clear of contaminated land.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on a brownfield site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities (e.g. security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale of construction would be reduced under RC/RPV storage options in the short term, it is expected that there would also be a reduction in waste arisings relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities ‘up front’). However, under RC/RPV storage options further arisings would be generated in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep waste volumes below thresholds where they would increase pressure on local and county wide waste management practices and facilities.

Proposed Mitigation / Enhancements Measures:

- No additional mitigation measures proposed above those set out for Option 1.

Summary: Option 2 has been assessed as having a negative effect in relation to this objective due to the volumes of waste arising from the construction required for the development of the site. Whilst the scale of activity will be less than that required for Option 1, redevelopment of a brownfield site may additional include the demolition and disposal of disused structures and the need to	**-/--**

Stage I: Designing and Developing Initial Submarine Dismantling Facilities Materials Assets (Waste Management)	
address contamination of the site (due to previous use). As a consequence, there is potential for the volumes of hazardous waste arising from the construction of the facility to be greater than that of Option 1. For RC and RPV storage options construction of the size reduction facility would be delayed, reducing associated waste arisings. However, further arisings would be generated in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep waste volumes below thresholds where they would increase pressure on local and county wide waste management practices and facilities.	

Option 3: Develop a Licensed/Authorised Site for Submarine Dismantling

Assessment of Effects:

The construction of SDP facilities on an existing Licensed/Authorised site could generate large amounts of construction wastes, however as it is expected that the scale of construction will be less than that identified within Option 1, therefore reducing the scale of negative effects accordingly. The key primary waste materials would be aggregates of varying size and composition, soil and spoil. Aggregates may come from any excavated or dredged material given the anticipated requirement for deepwater access to a proposed facility, however this may already be in place and minimal dredging under this option may be required.

Secondary wastes arising from construction activities would include:

- concrete, gypsum and other rendering materials;
- water from dust prevention and any surface runoff;
- woods and metals;
- packaging (blown foam, plastic ties, metal ties, wooden crates, pallets).

Tertiary wastes could include broken bricks/blocks, nails/bolts, worn tools, canisters, drums (e.g. fuel, diesel, chemicals) and food waste and food packaging from on site food consumption.

Depending on their type, wastes may be sent to landfill, recycled or re-used, for example, as landscaping or as aggregates for construction projects. Some of the waste may be treated as hazardous waste and would need to be handled in compliance with relevant waste regulations. It is anticipated that a residual amount of waste will enter the waste cycle that will require disposal.

It would be expected that the majority of the primary wastes arising could be reused or recycled, although in the case of any dredged material it will depend on sediment type. Recovery, reuse and recycling of secondary and tertiary materials may place additional pressure on local and county wide waste management practices and facilities, however as it is expected that the scale of construction will be less than that identified within Option 1 and slightly less than in Option 2, the volumes of waste arising will be commensurately less. It is further assumed that there will likely be requirement for some demolition of any disused buildings prior to construction which dependent on the scale of demolition required will affect the scale of waste arisings from the construction site requiring disposal. It is envisaged, however that there are likely to be numerous opportunities for reuse or recycling of recovered components and materials including infrastructure/buildings. As a consequence, it is expected that there will be limited/no impact on the existing waste management systems either nationally or locally during the construction of facilities due to the scale of infrastructure expected to be in situ.

Dredging is likely to feature within redevelopment of a existing Licensed/Authorised site due to the requirement for deepwater access to the proposed facility; however, it is expected that this would be less than identified within Option 1 and potentially less than in Option 2 due to the existing use of the site likely to require deepwater access through other existing activities.

A further consideration in relation to waste management is the extent to which the existing Licensed/Authorised site may contain historical contamination from previous and existing uses which may require remediation and or treatment and potential disposal. The likelihood of this on an existing licensed authorised site is greater than that of a greenfield and may result in hazardous waste streams if located. Even so it has been assumed that site development would not proceed on a site which had not previously been deemed clear of contaminated land.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total

Stage I: Designing and Developing Initial Submarine Dismantling Facilities Materials Assets (Waste Management)	
footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on an existing Licensed/Authorised site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities. A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage. As the scale of construction would be reduced under RC/RPV storage options in the short term, it is expected that there would also be a reduction in waste arisings relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities ‘up front’). However, under RC/RPV storage options further arisings would be generated in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep waste volumes below thresholds where they would increase pressure on local and county wide waste management practices and facilities. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective due to the volumes of waste arising from construction. Whilst the scale of activity will be less than that required for Option 1, redevelopment of an existing Licensed/Authorised site may additionally include the demolition and disposal of disused structures and the need to address contamination of the site (due to previous use). As a consequence, there is potential for the volumes of hazardous waste arising from the construction of the facility to be greater than that of Option 1. For RC and RPV storage options construction of the size reduction facility would be delayed, reducing associated waste arisings. However, further arisings would be generated in the longer term as a result of the construction of the size reduction facility and associated infrastructure/ancillary facilities although phasing may serve to keep waste volumes below thresholds where they would increase pressure on local and county wide waste management practices and facilities.	**-**

Stage II: Designing and Developing Interim ILW Storage Facilities

Materials Assets (Waste Management)

Option 1: Develop a Greenfield Site for ILW Storage

Assessment of Effects:

Given the generic nature of the construction proposals for the interim storage facility, it is assumed that the potential effects associated with this objective will be largely similar as for Stage 1 (construction of dismantling and size reduction facilities).

The construction of a storage facility and ancillary infrastructure on a greenfield site could generate large amounts of construction wastes. The key primary waste materials would be aggregates of varying size and composition, soil and spoil. Aggregates may come from any excavated or dredged material given the anticipated requirement for deepwater access to a proposed facility.

Secondary wastes arising from construction activities would include:

- concrete, gypsum and other rendering materials;
- water from dust prevention and any surface runoff;
- woods and metals;
- packaging (blown foam, plastic ties, metal ties, wooden crates, pallets).

Tertiary wastes could include broken bricks/blocks, nails/bolts, worn tools, canisters, drums (e.g. fuel, diesel, chemicals) and food waste and food packaging from on site food consumption.

Depending on their type, wastes may be sent to landfill, recycled or re-used, for example, as landscaping or as aggregates for construction projects. Some of the waste may be treated as hazardous waste and would need to be handled in compliance with relevant waste regulations.

It would be expected that the majority of the primary wastes arising could be reused or recycled, although in the case of the dredged material it will depend on sediment type. Recovery, reuse and recycling of secondary and tertiary materials may place additional pressure on local and county wide waste management practices and facilities.

It is anticipated that a residual amount of waste will enter the waste cycle that will require disposal.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area, as well reception, admin, dispatching, inspection and maintenance areas. Additional infrastructure will also be required under this land use option such as docking facilities, security (standoff and centre), car parking, roads and internal rail line although the total area required for these additional features is unknown.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities, car parking and roads will also be required under this land use option. Should RPVs be transported by sea (which is the most likely option) then docking facilities would also be required.
- Packaged Waste storage will require a facility with an area in the region of 1,005m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Additional infrastructure including security (standoff and centre), car parking, roads and an external rail line (if required), may also be required under this land use option. As Packaged Waste is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.

The volume of waste arisings associated with development of a storage facility is most likely to be greatest for the RC storage option given the increased footprint and land-take of greenfield land relative to RPV and Packaged Waste storage options. This increase in land take is expected to create aggregates and spoil particularly from excavation required to lay foundation of sufficient depth to accommodate RCs.

Furthermore, due to the need to transport RCs by sea, RC storage facilities would require the construction of a dock and dredging activities which would generate further waste. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised).

Stage II: Designing and Developing Interim ILW Storage Facilities

Materials Assets (Waste Management)

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities on a greenfield site).

Summary: Option 1 has been assessed as having a negative effect in relation to this objective due to the volume of construction wastes likely to arise from complete redevelopment and change of use of the greenfield site. Despite commitments to the reuse and recycling of wastes, some residual waste is anticipated to require disposal. Some of this residual waste may be treated as hazardous waste and would need to be handled in compliance with relevant waste regulations. The volume of waste arisings associated with development of a storage facility is most likely to be greatest for the RC storage option given the increased footprint and land-take of greenfield land relative to RPV and Packaged Waste storage options and the need for deep foundations. Further waste would also be generated under RC and RPV storage options due to the construction of a dock and dredging activities.	**-**

Option 2: Develop a Brownfield Site for ILW Storage

Assessment of Effects:

The construction of a storage facility and ancillary infrastructure on a brownfield site could generate large amounts of construction wastes; however, as it is expected that the scale of construction will be less than that identified within Option 1, the magnitude of the effects will be reduced accordingly. The key primary waste materials would be aggregates of varying size and composition, soil and spoil. Aggregates may come from any excavated or dredged material given the anticipated requirement for deepwater access to a proposed facility.

It is also assumed that there is likely to be requirement for some demolition of any disused or dilapidated buildings prior to construction which dependent on the scale of demolition required will affect the scale of waste arisings from the construction site requiring disposal.

It would be expected that the majority of the primary wastes arising could be reused or recycled, although in the case of the dredged material it will depend on sediment type. Recovery, reuse and recycling of secondary and tertiary materials may place additional pressure on local and county wide waste management practices and facilities, however as it is expected that the scale of construction will be less than that identified within option 1 the volumes of waste arising will be commensurately less.

A further consideration in relation to waste management is the extent to which the brownfield site may contain historical contamination from previous uses which will require remediation and or treatment and potential disposal. The likelihood of this on a brownfield is greater than that of a greenfield and may result in hazardous waste streams if located.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area, as well as reception, admin, dispatching, inspection and maintenance areas. Security facilities including a security centre and standoff area will also be required, as well as an internal rail line. However, it is assumed that docking facilities, car parking and roads will already be present.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and docking facilities (should RPV's be transported by sea) will already be present.
- Packaged Waste storage will require a facility with an area in the region of 1,005m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and external rail line (if required) will already be present. As Packaged Waste is likely to be transported by either road or rail, it is assumed that there will be no need for a docking facility.

The volume of waste arisings associated with development of a storage facility is most likely to be greatest for the RC storage option given the increased footprint and land-take relative to RPV and Packaged Waste storage options. This increase in land take is expected to create

Stage II: Designing and Developing Interim ILW Storage Facilities Materials Assets (Waste Management)	
aggregates and spoil particularly from excavation required to lay foundation of sufficient depth to accommodate RCs. Furthermore, due to the need to transport RCs by sea, RC storage facilities would require dredging activities which would generate further waste. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised). **Proposed Mitigation / Enhancements Measures:** Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).	
Summary: Option 2 has been assessed as having a negative effect in relation to this objective due to the volumes of waste arising from the construction required for the development of the site. Whilst the scale of activity will be less than that required for Option 1, redevelopment of a brownfield site may additional include the demolition and disposal of disused structures and the need to address contamination of the site (due to previous use). As a consequence, there is potential for the volumes of hazardous waste arising from the construction of the facility to be greater than that of Option 1. The volume of waste arisings associated with development of a storage facility is most likely to be greatest for the RC storage option given the increased footprint and land-take relative to RPV and Packaged Waste storage options and the need for deep foundations. Further waste would also be generated under RC and RPV storage options due to dredging activities.	**-**
Option 3: Develop a Licensed/Authorised Site for ILW Storage	

Assessment of Effects:

The construction of a storage facility and ancillary infrastructure on an existing Licensed/Authorised site could generate large amounts of construction wastes; however, as it is expected that the scale of construction will be less than that identified within Option 1, the magnitude of the effects will be reduced accordingly. The key primary waste materials would be aggregates of varying size and composition, soil and spoil. Aggregates may come from any excavated or dredged material given the anticipated requirement for deepwater access to a proposed facility.

It is also assumed that there is likely to be requirement for some demolition of any disused or dilapidated buildings prior to construction which dependent on the scale of demolition required will affect the scale of waste arisings from the construction site requiring disposal.

It would be expected that the majority of the primary wastes arising could be reused or recycled, although in the case of the dredged material it will depend on sediment type. Recovery, reuse and recycling of secondary and tertiary materials may place additional pressure on local and county wide waste management practices and facilities, however as it is expected that the scale of construction will be less than that identified within Option 1 the volumes of waste arising will be commensurately less.

A further consideration in relation to waste management is the extent to which the site may contain historical contamination from previous uses which will require remediation and or treatment and potential disposal. The likelihood of this on an existing Licensed/Authorised site is greater than that of a greenfield and may result in hazardous waste streams if located.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well reception, admin, dispatching, inspection and maintenance areas. It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present.
- RPV storage will require a facility with an area in the region of 801m^2 (including total vault area and reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present.
- Packaged Waste storage will require a facility with an area in the region of 1,005m^2 (including total vault area as well as reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as security (standoff

Stage II: Designing and Developing Interim ILW Storage Facilities Materials Assets (Waste Management)	
and centre), car parking, roads and external rail line (if required) are assumed to be already present. As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective due to the volumes of waste arising from the construction required for the development of the site. Whilst the scale of activity will be less than that required for option 1, redevelopment of an existing Licensed/Authorised site may additional include the demolition and disposal of disused structures and the need to address contamination of the site (due to previous use). As a consequence, there is potential for the volumes of hazardous waste arising from the construction of the facility to be greater than that of Option 1 and, potentially, Option 2. The volume of waste arisings associated with development of a storage facility is most likely to be greatest for the RC storage option given the increased footprint and land-take relative to RPV and Packaged Waste storage options and the need for deep foundations. Further waste would also be generated under RC and RPV storage options due to dredging activities.	-

Stage III: Docking the Submarines and Processing the Reactor Compartments

Materials Assets (Waste Management)

Option 1: Dock Submarine & Cut-Out Reactor Compartment

Assessment of Effects:

Expected wastes generated through RC cut out and processing includes; pipes, cables, metals, insulation materials, hull tiles and electrical materials. Some of the wastes generated through the dismantling/processing operation will be hazardous (such as asbestos, chromate paints and PCB containing cables) and would need to be handled in compliance with relevant waste regulations. In the case of asbestos it is assumed that specialised licensed contractors will be utilised for its disposal.

As the same life cycle activities will occur across each of the technical options it is assumed that the total non-radioactive waste generated during the lifetime of the project will be the same, although the total volume expected is uncertain. However it can be expected that as Option 1 delays the dismantling of RC and processing of Packaged Waste until after the interim storage there will be less waste generated at this stage.

It is assumed that no or very little LLW will be generated during RC cut out.

Public perception is that radioactive decay will result in less ILW being generated when the size reduction of RC occurs. However, whilst there will be a reduction in radioactivity associated with short lived isotopes (Co60), decay will not affect the longer lived isotopes and overall, due to isotope distribution and concentrations, delay will not lead to any significant reduction in ILW during the interim storage period. In consequence, it is estimated that the same amount of LLW will be produced under each option over the lifetime of the project (between 91 and 154 tonnes of LLW of which 95% can be decontaminated and recycled leaving between 4 and 44 tonnes to be disposed of).

It is anticipated that there would be opportunities to re-use and recycle waste materials. Many of the materials recovered during dismantling could be recycled or reused, such as steel, metals, electric materials and pipework. Furthermore, some of the process materials used may also be recycled, such as the steel shot used in the shot blasting process. Hazardous waste would need to be handled in compliance with relevant waste regulations.

There is the potential that during the delay of full dismantling of the RC and RPV to post interim storage, increased materials and volumes of materials could be recycled which would decrease the total volume of waste sent to landfill compared to the other options, however, this is very uncertain.

Proposed Mitigation / Enhancements Measures:

- Waste minimisation and management best practices should be implemented, with a focus on materials resource efficiency (using less and re-using more), in accordance with WRAP guidance, Delivering Effective Waste Minimisation and Delivering Good Practice Waste Management.
- Provision should be made for the segregation of wastes to enable a high level of recycling. Options for re-use of materials on site should be identified. Where re-use and recycling is not possible, options for disposal should be investigated to minimise environmental effects.
- A waste minimisation strategy should be implemented as part of the Site Waste Management Plan (SWMP). As a minimum, the SWMP should contain detailed measures to comply with relevant waste legislation but should also include good practice guidance and objectives in order to maximise the reduction, reuse and recovery of waste, with disposal to landfill as the least preferred option. The waste minimisation strategy should identify where waste arises in design, procurement and logistics and set out clear mechanisms for achieving waste reduction. Further guidance on site waste management is provided in the Department of Trade and Industry document, Site Waste Management Plans, Guidance for Construction Contractors and Clients and supplementary guidance available from WRAP (www.wrap.org.uk/construction).
- Best practice procedures for the protection, storage and handling of materials should be followed. A robust logistics plan should be developed, identifying how materials are to be moved to, from and on site and how they are stored. This could include just in time delivery or the use of consolidation centres to help reduce damage to materials and products by minimising the amount of time stored on site, and take back schemes for surplus material.

Summary:	
Option 1 has been assessed as having a negative effect in relation to this objective due to the volume of wastes likely to arise during the cut out of RC.	-

Stage III: Docking the Submarines and Processing the Reactor Compartments Materials Assets (Waste Management)	
Some of this will be hazardous waste and would need to be handled in compliance with relevant waste regulations. In the medium term it is assumed that there will be less waste generated under Option 1 than the other options as activities associated with RC and RPV initial dismantling will be delayed until after interim storage. Some materials will be recycled diverting the total waste from landfill but this is considered to be a relatively small percentage of the total waste generated.	
Option 2: Dock Submarine & Cut-Out Reactor Pressure Vessel	

Assessment of Effects

As the same life cycle activities will occur across each of the technical options it is assumed that the total and types of non-radioactive waste generated during processing activities for the lifetime of the project will be the same, although the total volume expected is uncertain. However it can be expected that under option 2 there will be additional activities prior to interim, related to RPV deplanting, which will increase the non-hazardous waste produced in the medium term relative to Option 1. Furthermore, these activities will result in the generation of some LLW in the medium term with the remainder LLW produced in the longer term (after interim storage when the RPV is processed). Assuming that the nature of radioactive decay would not change the volumes of LLW in the interim storage period, it is considered that the same amount of LLW will be produced under each option over the lifetime of the project (between 91 and 154 tonnes of LLW of which 95% can be decontaminated and recycled leaving between 4 and 44 tonnes to be disposed of).

Dismantling (RPV deplanting and removal) and sealing activities would also generate wastes (e.g. shot from blasting, pipes, cables, metals, systems and equipment from the RC, and scrap metal from removal of part of the submarine hull), including hazardous wastes (e.g. mineral oils, hydraulic fluids, refrigerant gases, asbestos, chromate paints and PCBs) and some LLW (e.g. the RPV head). No ILW would arise at the dismantling stage, as the ILW would be contained within the RPV, which would remain on site for interim storage.

Depending on their type, wastes generated as a result of construction, dismantling and sealing activities may be sent to landfill, recycled or reused. It is anticipated that there would be opportunities to re-use and recycle waste materials. Many of the materials recovered during dismantling could be recycled or reused, such as slag, steel, metals, electric materials and pipework. Furthermore, some of the process materials used may also be recycled, such as the steel shot used in the shot blasting process. Hazardous waste would need to be handled in compliance with relevant waste regulations.

There is the potential that during the delay of full dismantling of RPV to post interim storage that there could be increased materials and volumes of materials recycled which would decrease the total volume of waste sent to landfill compared to Option 3, however, this is very uncertain.

Proposed Mitigation / Enhancements Measures

- No additional mitigation measures proposed above those set out for Option 1.

Assumptions and Uncertainties

None identified.

Summary: Option 2 has been assessed as having a negative effect in relation to this objective due to the volume of wastes likely to arise during the cut out and dismantling of RC. Some of this would be hazardous waste and would need to be handled in compliance with relevant waste regulations. Due to additional activities associated with the deplanting and packaging of the RPV, this option will generate more waste in the medium term compared to Option 1, including LLW which will be transported to the National LLW Repository in Cumbria. Some materials will be recycled diverting the total waste from landfill but this is considered to be a relatively small percentage of the total waste generated.	**-**
Option 3: Dock Submarine & Cut-up Packaged Waste	

Stage III: Docking the Submarines and Processing the Reactor Compartments Materials Assets (Waste Management)	
Assessment of Effects: As the same life cycle activities will occur across each of the technical options it is assumed that the total and types of non-radioactive waste generated during processing activities for the lifetime of the project will be the same, although the total volume expected is uncertain. However it can be expected that under Option 3 there will be additional activities prior to interim storage, related RPV dismantling and processing of packaged waste, which will increase the non-hazardous waste produced in the medium term relative to option 2. Furthermore, these activities will result in the generation of between 91 and 154 tonnes of LLW of which 95% can be decontaminated and recycled leaving between 4 and 44 tonnes to be disposed of. There is a potential for recycling/reusing many of the materials recovered during the process, such as slag, steel, metals, electric materials and pipework, and also some of the process materials used, such as the steel shot used in the shot blasting process. **Proposed Mitigation / Enhancements Measures** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a negative effect in relation to this objective due to the volume of wastes likely to arise during the full processing of the submarine. Some of this would be hazardous waste and would need to be handled in compliance with relevant waste regulations. Due to additional activities associated with the dismantling of RPV and processing of Packaged Waste, option 3 will generate more waste in the medium term than the other options, including LLW which will be transported to the National Repository in Cumbria. Some materials will be recycled diverting the total waste from landfill but this is considered to be a relatively small percentage of the total waste generated.	-

Stage IV: Dismantling the Residual Submarine Hulls and Processing Wastes Materials Assets (Waste Management)	
All Options	
Assessment of Effects: The submarines will have already been drained of the majority of liquids (such as oils, lubricating fluids, coolants and hydraulic fluids) prior to long term storage at the lay-up location. Any remaining residual liquids will be removed during the preparation of submarines for dismantling along with any gaseous stores (such as from gas cylinders) and refrigerants (including ammonia and R134 gases). It is therefore assumed that the submarine will not contain any further liquid wastes requiring management. It is also assumed that each submarine will be required to be watertight prior to transportation. Prior to recycling, various aspects of the submarine will be removed to allow the processing to take place. This will include the removal of furnishings, cosmetic panelling, hull tiles, internal systems, insulating materials and any equipment that is of a sensitive military nature. It is therefore expected that there will be an increase in the levels of waste created from these activities at the initial dismantling facility. These will need to be managed appropriately and there may be a need for further waste management facilities to be provided in order to address these potential waste streams in the most appropriate manner. Potentially hazardous waste streams will include: substances or objects containing heavy metals such as lead, mercury, cadmium and hexavalent chromium; paints and coatings that are highly flammable and/or may lead to toxic releases during cutting; asbestos, and PCB containing cables. These would need to be handled in compliance with relevant waste regulations. In the case of asbestos it is assumed that specialised licensed contractors will be utilised for its disposal, especially within the older vessels. It is expected that these waste streams are likely to arise at both submarine dismantling and ship recycling stages of the submarine disposal process. Ship recycling will include the removal of large equipment, such as steam plant, pumps, large electrical drive motors. It is estimated that there is likely to be between 4000 and 7000 tonnes of materials that can be recycled, however more specific volumes will be dependent on the class of submarine to be recycled. Recyclable materials will include: steel (used to make the inner hull and the outer hulls); copper; aluminium; brass and lead (used within shielding as well as PVC coated lead ballast). There is likely to be use of cork filler and lagging throughout the vessel. Further, there will undoubtedly be other materials such as glass, plastics and rubber, alongside semiconductors such as silicon and germanium. Many of the materials recovered during the process of ship dismantling will be recycled or reused using extraction processes such as for mobilised or immobilised wastes, this will involve the use of chemical extraction of specific materials where necessary. It is likely that, some of the process materials used may also be recycled. **Proposed Mitigation / Enhancements Measures:** • The ship dismantling facility will need to be in receipt of the following documentation prior to the commencement of recycling; a ready for recycling certificate • Waste minimisation and management best practices should be implemented, with a focus on materials resource efficiency (using less and re-using more), in accordance with WRAP guidance, Delivering Effective Waste Minimisation and Delivering Good Practice Waste Management. • Provision should be made for the segregation of wastes to enable a high level of recycling. Options for re-use of materials on site should be identified. Where re-use and recycling is not possible, options for disposal should be investigated to minimise environmental effects. • A waste minimisation strategy should be implemented as part of the Site Waste Management Plan (SWMP). As a minimum, the SWMP should contain detailed measures to comply with relevant waste legislation but should also include good practice guidance and objectives in order to maximise the reduction, reuse and recovery of waste, with disposal to landfill as the least preferred option. The waste minimisation strategy should identify where waste arises and set out clear mechanisms for achieving waste reduction. • Best practice procedures for the protection, storage and handling of materials should be followed. A robust logistics plan should be developed, identifying how materials are to be moved to, from and on site and how they are stored. This could include just in time delivery or the use of consolidation centres to help reduce damage to materials and products by minimising the amount of time stored on site, and take back schemes for surplus material.	
Summary: Given the potential for high volumes of materials such as steels, copper, aluminium and lead to be recycled, this stage of the	**++/--**

Stage IV: Dismantling the Residual Submarine Hulls and Processing Wastes Materials Assets (Waste Management)	
project is considered to have a positive effect in relation to this objective. However, recycling will produce significant quantities of recyclable metals (total more than 100,000 tonnes); some hazardous wastes will also be generated such as zinc phosphate, trimite and tanclene it is also possible to assess this option as causing a negative effect against this objective.	

Stage V: Transporting RC/RPV/ILW to Interim Storage

Materials Assets (Waste Management)

Option 1: Reactor Compartment Transport and Storage

Assessment of Effects:

The movement of RC from the dismantling facility to the interim storage facility is expected to occur by sea via barge at a pace of one RC per annum which is not expected to result in any significant wastes arising.

Movement by sea will involve a number of specific activities that could generate a small volume of waste materials. As part of the preparation for transport, it is assumed that cut ends of the RC will be secured and covered with steel plate which could create waste streams albeit minor.

It is expected that during interim storage there will be minimal maintenance required (although these could increase, depending on how long the RC is stored for) and hence a small volume of waste potentially created. However, natural aging of RC's whilst in storage may result in the need for additional maintenance against issues such as corrosion in order to monitor and maintain the structural integrity. Further to this, it is evident that as the number of RCs increase in interim storage it is likely that the scale of waste arising from the interim storage has the potential to increase; however, it is still considered that this potential increase will remain minor.

Further to the maintenance required and the waste streams potentially created through these activities, there will also be general waste created during the interim storage through staff activities on site. These waste streams are expected to be similar to that of any normal commercial operation.

Proposed Mitigation / Enhancements Measures:

- Waste minimisation and management best practices should be implemented, with a focus on materials resource efficiency (using less and re-using more), in accordance with WRAP guidance, Delivering Effective Waste Minimisation and Delivering Good Practice Waste Management.
- Provision should be made for the segregation of wastes to enable a high level of recycling. Options for re-use of materials on site should be identified. Where re-use and recycling is not possible, options for disposal should be investigated to minimise environmental effects.
- A waste minimisation strategy should be implemented as part of the Site Waste Management Plan (SWMP). As a minimum, the SWMP should contain detailed measures to comply with relevant waste legislation but should also include good practice guidance and objectives in order to maximise the reduction, reuse and recovery of waste, with disposal to landfill as the least preferred option. The waste minimisation strategy should identify where waste arises and set out clear mechanisms for achieving waste reduction.
- Best practice procedures for the protection, storage and handling of materials should be followed. A robust logistics plan should be developed, identifying how materials are to be moved to, from and on site and how they are stored. This could include just in time delivery or the use of consolidation centres to help reduce damage to materials and products by minimising the amount of time stored on site, and take back schemes for surplus material.

Summary: Option 1 has been assessed as having a neutral effect in relation to this objective. Any waste arisings from the movement of RPV are considered to be trivial when compared to other stages of the SDP process.	**0**

Option 2: Reactor Pressure Vessel Transport and Storage

Stage V: Transporting RC/RPV/ILW to Interim Storage **Materials Assets (Waste Management)**	
Assessment of Effects: The movement of RPV from the dismantling facility to the interim storage facility (at a rate of approximately one movement per annum) can be undertaken by sea via barge, rail or road. However regardless of which transport option is determined it is not expected to result in any significant wastes arising It is expected that during interim storage there will be minimal maintenance required (although these could increase, depending on how long the RPV is stored for) and hence a small volume of waste potentially created. However, natural aging of RPVs whilst in storage may result in the need for additional maintenance against issues such as corrosion in order to monitor and maintain the structural integrity. Further to this it is evident that as the number of RPVs increase in interim storage it is likely that the scale of waste arising from the interim storage has the potential to increase; however, it is still considered that this potential increase will remain minor. Further to the maintenance required and the waste streams potentially created through these activities there will also be general waste created during the interim storage through staff activities on site. These waste streams are expected to be similar to that of any normal commercial operation. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures to Option 1 are proposed.	
Summary: Option 2 has been assessed as having a neutral effect in relation to this objective. Any waste arisings from the movement of RPV are considered to be trivial when compared to other stages of the SDP process.	**0**
Option 3: Packaged Waste Transport and Storage	
Assessment of Effects: The movement of Packaged Waste from the dismantling facility to the interim storage facility can be undertaken by rail or road. However regardless of which transport option is determined it is not expected to result in any significant wastes arising. It is expected that during interim storage there will be minimal maintenance required (although these could increase, depending on how long the Packaged Waste is stored for) and hence a small volume of waste could be potentially created. Further to the maintenance required and the waste streams potentially created through these activities there will also be general waste created during the interim storage through staff activities on site. These waste streams are expected to be similar to that of any normal commercial operation. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures to Option 1 are proposed. **Assumptions and Uncertainties:** • No Assumptions made	
Summary: Option 3 has been assessed as having a neutral effect in relation to this objective. Any waste arisings from the movement of Packaged Waste are considered to be trivial when compared to other stages of the SDP process.	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF **Materials Assets (Waste Management)**	
Option 1: Reactor Compartment Segregation and Size Reduction, Packaged Waste Transfer to Proposed GDF	
Assessment of Effects: The movement of RC from interim storage facility to the dismantling facility is expected to occur by sea via barge at a pace of one RC per annum which is not expected to result in any significant wastes arising. Expected wastes generated through RC dismantling includes; pipes, cables, metals, insulation materials, hull tiles and electrical materials. Some of the wastes generated through the dismantling/processing operation will be hazardous (such as asbestos, chromate paints and PCB containing cables) and would need to be handled and disposed of in compliance with relevant waste regulations. In the case of asbestos it is assumed that specialised licensed contractors will be utilised for its disposal. It is assumed that all waste management facilities for the disposal of any hazardous wastes or controlled wastes arising from dismantling are suitably licensed. As the same life cycle activities will occur across each of the technical options it is assumed that the total non-radioactive waste generated during the lifetime of the project will be the same, although the total volume expected is uncertain. However it can be expected that as Option 1 has delayed the dismantling of RC and processing of PW until after the interim storage there will be further waste generated at this stage. Public perception is that radioactive decay will result in less ILW being generated when the delayed full dismantling of the RC occurs. However, whilst there will be a reduction in radioactivity associated with short lived isotopes (Co60), decay will not affect the longer lived isotopes and overall, due to isotope distribution and concentrations, delay will not lead to any significant reduction in ILW during the interim storage period. In consequence, it is estimated that the same amount of ILW will be produced under each option over the lifetime of the project. It is anticipated that there would be opportunities to re-use and recycle waste materials. Many of the materials recovered during segregation and size reduction could be recycled or reused, such as steel, metals, electric materials and pipework. Furthermore, some of the process materials used may also be recycled, such as the steel shot used in the shot blasting process. There is the potential that during the delay of the full dismantling of RC to post interim storage that increased materials and volumes of materials could be recycled through potential technological developments in segregation of waste materials due to further constraints for landfill, which could potentially lead to associated increases in the cost of disposal, thus progressing the need for the development of alternatives. This in turn would decrease the total volume of waste sent to landfill compared to the other options, however, this is very uncertain. The RC casing is expected to have provided sufficient shielding for the RPV over the lifecycle of each submarine and during RC storage. On removal of all ILW and LLW, the casing will need to be size reduced and recycled on site. It is expected at this stage of the SDP programme that more than 800 tonnes of additional materials may be able to be recycled from the RC casing. **Proposed Mitigation / Enhancements Measures:** • Waste minimisation and management best practices should be implemented, with a focus on materials resource efficiency (using less and re-using more), in accordance with WRAP guidance, Delivering Effective Waste Minimisation and Delivering Good Practice Waste Management. • Provision should be made for the segregation of wastes to enable a high level of recycling. Options for re-use of materials on site should be identified. Where re-use and recycling is not possible, options for disposal should be investigated to minimise environmental effects. • Best practice procedures for the protection, storage and handling of materials should be followed. A robust logistics plan should be developed, identifying how materials are to be moved to, from and on site and how they are stored. This could include just in time delivery or the use of consolidation centres to help reduce damage to materials and products by minimising the amount of time stored on site, and take back schemes for surplus material.	
Summary: Option 1 has been assessed as having a mixed minor positive and a minor negative effect in relation to this objective due to the likely volume of wastes arising during the segregation and size reduction of RC. Some of this will be hazardous waste and	**+/-**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Materials Assets (Waste Management)	
would need to be handled in compliance with relevant waste regulations. However, this option also is expected to recycle more non hazardous waste than either of the other options (due to the 800 tonnes of the remainder of the RC) at this stage of the SDP process and therefore could be the most positive of the options. It is considered that under this option there could be increased materials and volumes of materials could be recycled through potential technological developments in segregation of waste materials due to further constraints for landfill, due to the time delay through RC storage.	
Option 2: Reactor Pressure Vessel Segregation and Size Reduction, Packaged Waste Transfer to Proposed GDF	
Assessment of Effects As the same life cycle activities will occur across each of the technical options it is assumed that the total and types of non-radioactive waste generated during processing activities for the lifetime of the project will be the same, although the total volume expected is uncertain. However it can be expected that under Option 2 there will have been additional activities within stage 3, related to RPV deplanting, which will decrease the non-hazardous waste produced during this stage relative to Option 1. Nonetheless, these activities will still result in the generation of some LLW in the longer term (after interim storage when the RPV is processed for PW). Assuming that the nature of radioactive decay would not change the volumes of LLW in the interim storage period, it is considered that the same amount of LLW will be produced under each option over the lifetime of the project (approximately 173 tonnes of LLW/ILW in total with approximately 44 tonnes of LLW for actual disposal.) Hazardous waste would need to be handled in compliance with relevant waste regulations. **Proposed Mitigation / Enhancements Measures** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a mixed neutral and minor negative effect in relation to this objective due to the volume of LLW and ILW likely to arise during the segregation and size reduction of RPV. There may also be some small quantities of hazardous waste that would need to be handled in compliance with relevant waste regulations. Due to the reduction in activities associated with the RPV size reduction in comparison to Option 1, this option will generate less waste and the potential for recycling of any material will be more limited.	**0/-**
Option 3: Transport Packaged Waste Transfer to Proposed GDF	
Assessment of Effects: As the same life cycle activities will occur across each of the technical options it is assumed that the total and types of non-radioactive waste generated during processing activities for the lifetime of the project will be the same, although the total volume expected is uncertain. However it can be expected that under Option 3 there will be no further segregation or size reduction activities and no further waste arising. **Proposed Mitigation / Enhancements Measures** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a neutral effect in relation to this objective as there will be no change to the volume of wastes generated.	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Materials Assets (Waste Management)

Stage VII: Decommissioning the SDP Facilities

Materials Assets (Waste Management)

Option 1: Decommission Greenfield Site

Assessment of Effects:

The demolition and decommissioning of SDP facilities constructed on greenfield land could generate large amounts of demolition wastes. The primary waste materials would be aggregates of varying size and composition, soil and spoil. Aggregates may come from any excavated material. Secondary wastes arising from decommissioning activities would include:

- concrete, gypsum and other rendering materials;
- water from dust prevention and any surface runoff;
- woods and metals;

Tertiary wastes could include broken bricks/blocks, nails/bolts, worn tools, canisters, drums (e.g. fuel, diesel, chemicals) and food waste and food packaging from on site food consumption.

Depending on their type, wastes may be sent to landfill, recycled or re-used, for example, as landscaping or as aggregates for construction projects. Some of the waste may be treated as hazardous waste and would need to be handled in compliance with relevant waste regulations.

It would be expected that the majority of the primary wastes arising could be reused or recycled. Recovery, reuse and recycling of secondary and tertiary materials may place additional pressure on local and county wide waste management practices and facilities. It would therefore be assumed that the majority of non-hazardous material arising from demolition would be reused elsewhere in construction projects. There will be ILW and LLW created from the dismantling of the size reduction facility, and in particularly, associated with the hot cell which is likely to include steel and concrete as well as any contaminated cut up tools and equipment and will need to packaged and transferred to either the proposed GDF or LLW repository. At this stage, the quantities of ILW and LLW waste are unknown but are not anticipated to be significant.

It is anticipated that a residual amount of waste will enter the waste stream that will require disposal.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste storage options and, on a greenfield site, removal of docking facilities alongside other infrastructure would also be required. Therefore, it is expected that this technical option will generate the greatest volume of waste although It would be expected that the majority of the primary wastes arising could be reused or recycled. RPV storage may also require the removal of docking facilities (if RPV is transported to site by sea) and therefore this technical option could have greater effects associated with decommissioning on this objective than the Packaged Waste storage option.

Proposed Mitigation / Enhancements Measures:

- Waste minimisation and management best practices should be implemented, with a focus on materials resource efficiency (using less and re-using more), in accordance with WRAP guidance, Delivering Effective Waste Minimisation and Delivering Good Practice Waste Management.
- Best practice procedures for the protection, storage and handling of materials should be followed. A robust logistics plan should be developed, identifying how materials are to be moved to, from and on site and how they are stored. This could include just in time delivery or the use of consolidation centres to help reduce damage to materials and products by minimising the amount of time stored on site, and take back schemes for surplus material.
- Provision should be made for the segregation of wastes to enable a high level of recycling. Options for re-use of materials on site should be identified. Where re-use and recycling is not possible, options for disposal should be investigated to minimise environmental effects.
- A waste minimisation strategy should be implemented as part of the Site Waste Management Plan (SWMP). As a minimum, the SWMP should contain detailed measures to comply with relevant waste legislation but should also include good practice guidance and objectives

Stage VII: Decommissioning the SDP Facilities Materials Assets (Waste Management)	
in order to maximise the reduction, reuse and recovery of waste, with disposal to landfill as the least preferred option.	
Summary: Option 1 has been assessed as having both a significantly positive and significantly negative effect in relation to this objective due to the generation of large volumes of demolition wastes that will be produced in the first instance as well as recognising the high potential for the majority of primary wastes to be reused in other construction projects due to these being non hazardous aggregates. Therefore Option 1 is likely to lead to the greatest opportunities for reuse and recycling. Similarly, RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste storage options. Therefore, it is expected that this technical option will generate the greatest volume of waste to be reused or recycled. Despite commitments to the reuse and recycling of wastes, some residual waste is anticipated to require disposal. Some of this residual waste may be treated as hazardous waste and would need to be handled in compliance with relevant waste regulations. It is further expected that there will be an undefined level of ILW and LLW waste primarily from the size reduction facility which it is expected will be able to be processed and retained for storage. However, quantities of hazardous/radiological waste will be similar across all generic land use options.	**--/++**
Option 2: Decommission Brownfield Site	
Assessment of Effects: The demolition and decommissioning of SDP facilities constructed on brownfield land could generate large amounts of demolition wastes including an unknown quantity of ILW and LLW. The range of potential waste streams and their management will be expected to be similar to that for Option 1. However, the quantities of waste, and the potential volumes for reuse and recycling will be considerably less than Option VII.1 and so any beneficial effects will also be less. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste storage options. Therefore, it is expected that this technical option will generate the greatest volume of waste although It would be expected that the majority of the primary wastes arising could be reused or recycled. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: Option 2 has been assessed as having a mixed minor positive and minor negative effect in relation to this objective due to the diminished volumes of total waste arisings and the volumes of which could be reused as aggregates for other construction projects compared to that for Option 1. Decommissioning and demolition of a brownfield site may additionally include the demolition and disposal of disused structures and the need to address contamination of the site (due to previous use). As a consequence, there is potential for the volumes of hazardous waste arising from the demolition of the facility to be greater than that of Option 1.	**-/+**
Option 3: Decommission Licensed/Authorised Sites	

Stage VII: Decommissioning the SDP Facilities Materials Assets (Waste Management)	
Assessment of Effects: The decommissioning and demolition of SDP facilities constructed on existing Licensed/Authorised sites could generate large amounts of demolition wastes including an undefined quantity of ILW and LLW. However, it is expected that the scale of demolition will be less than that identified within Option 1 and potentially 2 and therefore the quantities of waste, and the potential volumes for reuse and recycling, will be considerably reduced. It would be expected that the majority of the primary wastes arising could be reused or recycled. It is envisaged that there are likely to be numerous opportunities for reuse or recycling of recovered components and materials including infrastructure/buildings. As a consequence, it is expected that there will be limited/no impact on the existing waste management systems either nationally or locally during the demolition of facilities due to the scale of infrastructure expected to remain in situ. Depending on whether there are any other developments proceeding on existing Licensed/Authorised sites, there is potential for those demolition wastes that are suitable for reuse in construction projects (as hardcore) to be used elsewhere on the site. This would avoid the need to transfer such waste off site. However, this will dependent on the development requirements of the site when decommissioning of SDP facilities occurs and cannot be anticipated at this point. A further consideration in relation to waste management is the extent to which existing Licensed/Authorised sites may contain historical contamination from previous and existing uses which may require remediation and or treatment and potential disposal. The likelihood of this on an existing Licensed/Authorised site is greater than that of a greenfield site and may result in increased hazardous waste streams. Even so it has been assumed that site decommissioning would not be complete until it had officially been deemed clear of contaminated land. **Technical Options:** As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence of the technical options on their severity is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: Option 3 has been assessed as having a mixed minor positive and negative effect in relation to this objective due to the volumes of waste arising from the demolition of the site and the decrease in the potential for reuse and recycling compared to Option 1. Whilst the scale of activity will be less than that required for Option 1, decommissioning of an existing Licensed/Authorised site is expected to include the demolition and disposal of disused structures and a potential need to address contamination of the site.	**-/+**

11.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the waste management objective. **Box 11.2** provides a summary of the options that have been assessed.

Box 11.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 11.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities.	-/+	-/+	-/+	<u>**Potential Effects**</u> It is expected that submarines will be wet towed into the dockyard. In the unlikely event that submarines are transported using a heavy lift vessel, there may be waste material arising from any dredging or channel modifications *(refer to impacts specific to the Devonport and Rosyth dockyards).* Modification of existing facilities and construction of new SDP facilities would generate construction wastes (e.g. concrete, gypsum and other rendering materials, water from dust prevention and any surface run-off, woods and metals, packaging, fuel, diesel and chemical drums), some of which may be hazardous (e.g. asbestos and contaminated soil). Initial dismantling (RC cut out) would also generate wastes (e.g. shot from blasting, pipes, cables, metals, plant and equipment from the compartments adjacent to the RC, and scrap metal from removal of the hull tiles and sealing of the separated fore and aft hull sections and the RC), including hazardous wastes (e.g. mineral oils, hydraulic fluids, refrigerant gases, asbestos, chromate paints and PCBs). No radioactive waste would arise at the initial dismantling stage as any LLW and ILW would be contained within the RC, which would remain on site for interim storage. Depending on their type, wastes generated as a result of construction and initial dismantling activities may be sent to landfill, recycled or reused. It is anticipated that there would be opportunities to re-use and recycle waste materials. Many of the materials recovered during dismantling could be recycled or reused, such as steel, metals, electric materials and pipework. Furthermore, some of the process materials used may also be recycled, such as the steel shot used in the shot blasting process. Hazardous waste would need to be handled in compliance with relevant waste regulations. Both the Devonport and Rosyth dockyards have existing general waste management facilities that could be utilised *(refer to impacts specific to the Devonport and Rosyth dockyards).* Following removal of the RC, the separated fore and aft hull sections would be sealed and transported to the ship recycling facility for dismantling. Although unknown at this stage it is anticipated that many of the materials recovered during the process of submarine dismantling would be recycled or reused. For each of the submarines it is estimated that there is likely to be between 4,000 and 7,000 tonnes of materials which can be recycled, depending on the class of submarine. Any recycling and recovery of materials from submarines would contribute positively towards this objective. Once the RC has been placed into interim storage, it is assumed that there would be limited waste arising as the RC would essentially be left in-situ. However, there may be some very small quantities of hazardous waste arising from monitoring activities (e.g. overshoes and protective clothing).
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+	-/+	-/+	Following the interim storage period, the RC would be segregated, and the resulting LLW and ILW packaged for disposal in the LLWR and the proposed GDF respectively. LLW volumes are estimated to be in the order of between 91 tonnes and 154 tonnes per submarine (between 513 and 4,158 tonnes of LLW in total for 27 submarines), an estimated 4 tonnes to 44 tonnes of which would be disposed of at the LLWR, with the remainder decontaminated and recycled. ILW volumes are estimated to be between 19 tonnes and 58 tonnes. Although radioactivity levels of ILW would reduce during the interim storage period of the RC, this would not result in the reclassification of any ILW. There would therefore be no change to the amount of long lived ILW for disposal. SDP activities are not anticipated to affect the capacity of existing waste management systems, as the waste management facilities required to undertake SDP activities would be provided on-site. Of the technical options, the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2, and therefore waste generation during construction could be greater for the RC option (depending on facility design and build requirements). However, in the case of the RC option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				only. Construction of facilities for full dismantling would not take place until the interim storage period is nearing completion. Separating activities into two phases could help to ensure that waste is handled and sorted more effectively. A delay in beginning the size reduction of the RC would mean that recyclable LLW from the RC would not be released until after the interim storage period. However, there is the potential that during the delay of full dismantling of RC to post interim storage that recycling technologies may have progressed, allowing greater recovery of wastes. Although, this is very uncertain. Devonport Dockyard Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into the dockyard and fore and aft sections out to the commercial recycling facility. In the unlikely event that submarines or fore and aft sections are transported using heavy lift vessel, significant dredging and channel modification would be required to create sufficient deep water (an estimated 300m wide area to a depth of 22-25+ metres would be required for heavy lift operations) resulting in considerable amounts of dredged material for disposal on to land or at sea. The depth of water in those areas of Plymouth Sound that could be appropriate for heavy lift operations is estimated to be 15m. Taking account of this depth, dredging to 10m to create an area up to 25m deep and 300m wide would produce approx. 706,000 tonnes of dredged material. Depending on the nature of the dredged material there could be the potential for the material to be put to beneficial use, e.g. for engineered uses (land creation or improvement, shore protection, beach nourishment etc), agricultural and product uses (construction materials, aquaculture, topsoil etc), and environmental enhancement (wildlife habitats, fisheries improvement, wetland restoration etc). There are existing general waste and LLW management facilities at Devonport dockyard, which are understood to be generally sufficient for SDP activities. However, the facilities are not co-located. Optimising the use of existing facilities may therefore require rationalisation to produce an integrated waste management facility with the capacity to treat all LLW arising.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+	-/+	-/+	Additional craneage may be required at Devonport dockyard to support the receipt area of the waste management facility. The current Effluent Treatment Plant (ETP) may also require modification and upgrade to receive liquor from ILW size reduction and conditioning processes. Additional radiochemical analysis equipment and HP monitoring equipment may be required and there would be a requirement for provision of a receipt bay (incoming waste) to receive radiological waste from the submarines. To handle LLW from SDP activities a larger LLW lay down area would be required to support submarine dismantling, LLW stands would need to be provided and the Shield Size Reduction Cells would need to be reconfigured. Existing size reduction capability may need to be extended. It is considered that existing LLW conditioning and packaging facilities would need to be optimised, with further waste sorting capacity and shielded buffer storage provided. There are currently no ISO bays at Devonport dockyard, so these would also need to be provided. It is assumed that the existing scrap yard at Devonport dockyard can be utilised, but additional space and equipment for non active waste management may be required. This is dependant on the security declassification strategy provided. Existing ILW facilities at Devonport dockyard are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction / segregation of ILW structures and options for utilising existing buildings are limited. New ILW processing, conditioning and packaging, and storage and consignment facilities would therefore need to be constructed. Rosyth Dockyard Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. There are existing general waste and LLW management facilities at Rosyth dockyard, which are understood to be generally sufficient for SDP activities, assuming that the Active Waste Accumulation Facility (AWAF) at the dockyard would be available for storage, segregation,

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				handling, packaging, and dispatch of radioactive waste. However, modification may be required to the Overhead Trolley (OHT) and ETP. It is understood that the existing Portable Effluent Treatment Plant (PETP) is suitable only for low quantities of contaminated water and therefore it is assumed that an upgrade would be required. Larger bowser capacity for the holding tanks (receipt and discharge capability would also be required. There is currently no portable plant and jet vacs at the Rosyth dockyard so these facilities would need to be provided. There is currently limited effluent treatment capacity and LLW size reduction capability at Rosyth dockyard. Liquor receipt / storage and disposal is limited to PETP capacity and there are no LLW stands, surface decontamination facilities, size reduction facilities, including Shielded Size Reduction Cells or LLW handling equipment / frames / craneage. To handle LLW from SDP activities these facilities would therefore need to be provided. Existing LLW conditioning and packaging plant at Rosyth dockyard is, however, highly compatible for SDP activities and is assumed to require little modification. It is assumed that the existing scrap yard at Rosyth dockyard can be utilised, but additional space and equipment for non active waste management may be required. This is dependant on the security declassification strategy provided. Existing ILW facilities at Rosyth dockyard are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction / segregation of ILW structures and options for utilising existing buildings are limited. New ILW processing, conditioning and packaging, and storage and consignment facilities would therefore need to be constructed. Options for utilising existing buildings at Rosyth dockyard for ILW management are limited to modification of the AWAF.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+	-/+	-/+	**<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Waste generation associated with construction activities within the dockyards could therefore be greater for Option1D. Notwithstanding this, taking account of the scale of development required, this is not anticipated to result in any significant difference in waste arisings between the two dockyards associated with construction activities within the dockyards. In the unlikely event that submarines are transported using heavy lift vessel significant dredging would be required at Devonport dockyard, resulting in an additional waste stream for disposal, with considerable amounts of dredged material arising for disposal on to land or at sea. Notwithstanding this, depending on the nature of the dredged material there could be the potential for the dredged material to be put to beneficial use. In the case of Rosyth dockyard, no channel modification or dredging would be required and as such no dredged material requiring disposal would arise. Taking account of existing facility provision, both the Devonport and Rosyth dockyards have waste management facilities that could be utilised for SDP activities, with some modification and new build required. Rosyth dockyard has a better capability for additional LLW processing than Devonport dockyard due to the availability of the AWAF. Further work would be required at Devonport dockyard to optimise the function of the existing waste management facilities; in particular, storage of radioactive waste is limited at Devonport. Both dockyards would require the construction of facilities for ILW management. Notwithstanding this, assuming that both dockyards can accommodate the required waste management facilities there is not anticipated to be any difference in waste management capability and opportunity to minimise, recover and recycle waste between the two dockyards. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster dismantling of submarines, creating opportunity to recover recyclable materials from submarines quicker. Notwithstanding this,

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				SDP facilities would need to be provided at both dockyards, which may result in greater volumes of waste arisings associated with construction of SDP facilities within the dockyards when compared to Options 1D and 1R.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities.	-/+	-/+	-/+	**Potential Effects** It is expected that submarines will be wet towed into the dockyard. Modification of existing facilities and construction of new SDP facilities would generate construction wastes (e.g. concrete, gypsum and other rendering materials, water from dust prevention and any surface run-off, woods and metals, packaging, fuel, diesel and chemical drums), some of which may be hazardous (e.g. asbestos and contaminated soil). Initial dismantling (RPV removal) would also generate wastes (e.g. shot from blasting, pipes, cables, metals, systems and equipment from the RC, and scrap metal from removal of part of the submarine hull), including hazardous wastes (e.g. mineral oils, hydraulic fluids, refrigerant gases, asbestos, chromate paints and PCBs) and some LLW (e.g. the RPV head). No ILW would arise at the initial dismantling stage as the ILW would be contained within the RPV, which would remain on site for interim storage. Depending on their type, wastes generated as a result of construction, dismantling and sealing activities may be sent to landfill, recycled or reused. It is anticipated that there would be opportunities to re-use and recycle waste materials. Many of the materials recovered during dismantling could be recycled or reused, such as steel, metals, electric materials and pipework. Furthermore, some of the process materials used may also be recycled, such as the steel shot used in the shot blasting process. Hazardous waste would need to be handled in compliance with relevant waste regulations. Both the Devonport and Rosyth dockyards have existing general waste management facilities that could be utilised *(refer to impacts specific to the Devonport and Rosyth dockyards).* Following removal of the RPV, the hull would be re-sealed and the submarine transported to the ship recycling facility for dismantling. Although unknown at this stage it is anticipated that many of the materials recovered during the process of submarine dismantling would be recycled or reused. For each of the submarines it is estimated that there is likely to be between 4,000 and 7,000 tonnes of materials which can be recycled, depending on the class of submarine. Any recycling and recovery of materials from submarines would contribute positively towards this objective. Once the RPV has been placed into interim storage, it is assumed that there would be limited waste arising as the RPV would essentially be left in-situ. However, there may be some very small quantities of hazardous waste arising from monitoring activities (e.g. overshoes and protective clothing).
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+	-/+	-/+	Following the interim storage period, the RPV would be segregated, and the resulting LLW and ILW packaged for disposal in the LLWR and the proposed GDF respectively. LLW volumes are estimated to be in the order of between 91 tonnes and 154 tonnes per submarine (between 513 and 4,158 tonnes of LLW in total for 27 submarines), an estimated 4 tonnes to 44 tonnes of which would be disposed of at the LLWR, with the remainder decontaminated and recycled. ILW volumes are estimated to be between 19 tonnes and 58 tonnes. Although radioactivity levels of ILW would reduce during the interim storage period of the RC, this would not result in the reclassification of any ILW. There would therefore be no change to the amount of long lived ILW for disposal. SDP activities are not anticipated to affect the capacity of existing waste management systems, as the waste management facilities required to undertake SDP activities would be provided on-site). Of the technical options, the scale of development required for the RPV option would be smaller than the other technical options, with the RPV option requiring a new interim storage area with a footprint of $801m^2$. The RPV option would therefore be likely to generate the least wastes during construction when compared to the other technical options (depending on facility design and build requirements). In addition, in the case of the RPV option construction of SDP facilities would be phased, within initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for full dismantling of the RPV

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				would not take place until the interim storage period is nearing completion. Separating activities into two phases could help to ensure that waste is handled and sorted more effectively. A delay in beginning the size reduction of the RPV would mean that some recyclable LLW from the RPV would not be released until after the interim storage period. However, there is the potential that during the delay of full dismantling of the RPV to post interim storage that recycling technologies may have progressed, allowing greater recovery of wastes. However, this is very uncertain. <u>Devonport Dockyard</u> Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. There are existing general waste and LLW management facilities at Devonport dockyard, which are understood to be generally sufficient for SDP activities. However, the facilities are not located within one area. Optimising the use of existing facilities may therefore require rationalisation / upgrades to produce an integrated waste management facility with the capacity to treat all LLW arising. Additional craneage may be required at Devonport dockyard to support the receipt area of the waste management facility. The current ETP may also require modification and upgrade to receive liquor from ILW size reduction and conditioning processes. Additional radiochemical analysis equipment and HP monitoring equipment may be required and there would be a requirement for provision of a receipt bay (incoming waste) to receive radiological waste from the submarines.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+	-/+	-/+	To handle LLW from SDP activities a larger LLW lay down area would be required to support submarine dismantling, LLW stands would need to be provided and the Shield Size Reduction Cells would need to be reconfigured. Existing size reduction capability may need to be extended. It is considered that existing LLW conditioning and packaging facilities would need to be optimised, with further waste sorting capacity and shielded buffer storage provided. There are currently no ISO bays at Devonport dockyard, so these would also need to be provided. It is assumed that the existing scrap yard at Devonport dockyard can be utilised, but additional space and equipment for non active waste management may be required. This is dependant on the security declassification strategy provided. Existing ILW facilities at Devonport dockyard are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction / segregation of ILW structures and options for utilising existing buildings are limited. New ILW processing, conditioning and packaging, and storage and consignment facilities would therefore need to be constructed. <u>Rosyth Dockyard</u> Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. There are existing general waste and LLW management facilities at Rosyth dockyard, which are understood to be generally sufficient for SDP activities, assuming that the AWAF at the dockyard would be available for storage, segregation, handling, packaging, and dispatch of radioactive waste. However, modification may be required to the OHT and ETP. It is understood that the existing PETP is suitable only for low quantities of contaminated water and therefore it is assumed that an upgrade would be required. Larger bowser capacity for the holding tanks (receipt and discharge capability would also be required. There is currently no portable plant and jet vacs at the Rosyth dockyard so these facilities would need to be provided. There is currently limited effluent treatment capacity and LLW size reduction capability at Rosyth dockyard. Liquor receipt / storage and disposal is limited to PETP capacity and there are no LLW stands, surface decontamination facilities, size reduction facilities, including Shielded Size Reduction Cells or LLW handling equipment / frames / craneage. To handle LLW from SDP activities these facilities would therefore need to be provided.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				Existing LLW conditioning and packaging plant at Rosyth dockyard is, however, highly compatible for SDP activities and is assumed to require little modification. It is assumed that the existing scrap yard at Rosyth dockyard can be utilised, but additional space and equipment for non active waste management may be required. This is dependant on the security declassification strategy provided. Existing ILW facilities at Rosyth dockyard are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction / segregation of ILW structures and options for utilising existing buildings are limited. New ILW processing, conditioning and packaging, and storage and consignment facilities would therefore need to be constructed. Options for utilising existing buildings at Rosyth dockyard for ILW management are limited to modification of the AWAF.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+	-/+	-/+	**<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Waste generation associated with construction activities within the dockyards could therefore be greater for Option 2D. Notwithstanding this, taking account of the scale of development required, this is not anticipated to result in any significant difference in waste arisings between the two dockyards associated with construction activities within the dockyards. Taking account of existing facility provision, both the Devonport and Rosyth dockyards have waste management facilities that could be utilised for SDP activities, with some modification and new build required. Rosyth dockyard has a better capability for additional LLW processing than Devonport dockyard due to the availability of the AWAF. Further work would be required at Devonport dockyard to optimise the function of the existing waste management facilities; in particular, storage of radioactive waste is limited at Devonport. Both dockyards would require the construction of facilities for ILW management. Notwithstanding this, assuming that both dockyards can accommodate the required waste management facilities there is not anticipated to be any difference in waste management capability and opportunity to minimise, recover and recycle waste between the two dockyards. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster draw down on the stock of laid-up submarines, creating opportunity to recover recyclable materials from submarines quicker. Notwithstanding this, SDP facilities would need to be provided at both dockyards, which may result in greater volumes of waste arisings associated with construction of SDP facilities within the dockyards when compared to Options 2D and 2R.

Option 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities.	- /+/?	- /+/?	- /+/?	**Potential Effects** It is expected that submarines will be wet towed into/out of the dockyard. Modification of existing facilities and construction of new SDP facilities would generate construction wastes (e.g. concrete, gypsum and other rendering materials, water from dust prevention and any surface run-off, woods and metals, packaging, fuel, diesel and chemical drums), some of which may be hazardous (e.g. asbestos and contaminated soil). Initial dismantling (RPV removal) would also generate wastes (e.g. shot from blasting, pipes, cables, metals, systems and equipment from the RC, and scrap metal from removal of part of the submarine hull), including hazardous wastes (e.g. mineral oils, hydraulic fluids, refrigerant gases, asbestos, chromate paints and PCBs) and some LLW (e.g. the RPV head). No ILW would arise at the initial dismantling stage as the ILW would be contained within the RPV, which in the case of this option would be transported from the dismantling site to a remote site for interim storage.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	- /+/?	- /+/?	- /+/?	Depending on their type, wastes generated as a result of construction, dismantling and sealing/packaging activities may be sent to landfill, recycled or reused. It is anticipated that there would be opportunities to re-use and recycle waste materials. Many of the materials recovered during dismantling could be recycled or reused, such as steel, metals, electric materials and pipework. Furthermore, some of the process materials used may also be recycled, such as the steel shot used in the shot blasting process. Hazardous waste would need to be handled in compliance with relevant waste regulations. Both the Devonport and Rosyth dockyards have existing general waste management facilities that could be utilised *(refer to impacts specific to the Devonport and Rosyth dockyards).* Following removal of the RPV, the hull would be re-sealed and the submarine transported to the ship recycling facility for dismantling. Although unknown at this stage it is anticipated that many of the materials recovered during the process of submarine dismantling would be recycled or reused. For each of the submarines it is estimated that there is likely to be between 4,000 and 7,000 tonnes of materials which can be recycled, depending on the class of submarine. Any recycling and recovery of materials from submarines would contribute positively towards this objective. In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation/size reduction (full dismantling of the RPV). Once the RPV has been transported to the remote site and placed into interim storage, it is assumed that there would be limited waste arising as the RPV would essentially be left in-situ. However, there may be some very small quantities of hazardous waste arising from monitoring activities (e.g. overshoes and protective clothing). Following the interim storage period, the RPV would be segregated, and the resulting LLW and ILW packaged for disposal in the LLWR and the proposed GDF respectively. LLW volumes are estimated to be in the order of between 91 tonnes and 154 tonnes per submarine (between 513 and 4,158 tonnes of LLW in total for 27 submarines), an estimated 4 tonnes to 44 tonnes of which would be disposed of at the LLWR, with the remainder decontaminated and recycled. ILW volumes are estimated to be between 19 tonnes and 58 tonnes. Although radioactivity levels of ILW would reduce during the interim storage period of the RC, this would not result in the reclassification of any ILW. There would therefore be no change to the amount of long lived ILW for disposal. SDP activities are not anticipated to affect the capacity of existing waste management systems, as the waste management facilities required to undertake SDP activities would be provided on-site). Of the technical options, the scale of development required for the RPV option would be smaller than the other technical options, with the RPV option requiring a new interim storage area with a footprint of 801m^2. The RPV option would therefore be likely to generate the least wastes during construction when compared to the other technical options (depending on facility design and build requirements). In addition, in the case of the RPV option

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				construction of SDP facilities would be phased, within initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for segregation and size reduction of the RPV would not take place until after the interim storage period. Separating activities into two phases could help to ensure that waste is handled and sorted more effectively. A delay in beginning the full dismantling of the RPV would mean that some recyclable LLW from the RPV would not be released until after the interim storage period. However, there is the potential that during the delay of full dismantling of the RPV to post interim storage that recycling technologies may have progressed, allowing greater recovery of wastes. However, this is very uncertain.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	- /+/?	- /+/?	- /+/?	Devonport Dockyard Based on current known information it is understood that the channel arrangements at Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. There are existing general waste and LLW management facilities at Devonport dockyard, which are understood to be generally sufficient for dismantling activities. However, the facilities are not located within one area. Optimising the use of existing facilities may therefore require rationalisation / upgrades to produce an integrated waste management facility with the capacity to treat all LLW arising Additional craneage may be required at Devonport dockyard to support the receipt area of the waste management facility. Additional radiochemical analysis equipment and HP monitoring equipment may be required and there would be a requirement for provision of a receipt bay (incoming waste) to receive radiological waste from the submarines. To handle LLW from SDP activities a larger LLW lay down area would be required to support submarine dismantling, LLW stands would need to be provided and the Shield Size Reduction Cells would need to be reconfigured. Existing size reduction capability may need to be extended. It is considered that existing LLW conditioning and packaging facilities would need to be optimised, with further waste sorting capacity and shielded buffer storage provided. There are currently no ISO bays at Devonport dockyard, so these would also need to be provided. It is assumed that the existing scrap yard at Devonport dockyard can be utilised, but additional space and equipment for non active waste management may be required. This is dependant on the security declassification strategy provided Rosyth Dockyard Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. There are existing general waste and LLW management facilities at Rosyth dockyard, which are understood to be generally sufficient for SDP activities, assuming that the AWAF at the dockyard would be available. However, modification may be required to the OHT and ETP. It is understood that the existing PETP is suitable only for low quantities of contaminated water and therefore it is assumed that an upgrade would be required. Larger bowser capacity for the holding tanks (receipt and discharge capability would also be required. There is currently no portable plant and jet vacs at the Rosyth dockyard so these facilities would need to be provided.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+/?	-/+/?	-/+/?	There is currently limited effluent treatment capacity and LLW size reduction capability at Rosyth dockyard. Liquor receipt / storage and disposal is limited to PETP capacity and there are no LLW stands, surface decontamination facilities, size reduction facilities, including Shielded Size Reduction Cells or LLW handling equipment / frames / craneage. To handle LLW from dismantling activities these facilities would therefore need to be provided. Existing LLW conditioning and packaging plant at Rosyth dockyard is, however, highly compatible for dismantling activities and is assumed to require little modification. It is assumed that the existing scrap yard at Rosyth dockyard can be utilised, but additional space and equipment for non active waste management may be required. This is dependant on the security declassification strategy provided. **<u>Comparison of the Options</u>** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. Assuming that both dockyards can accommodate the required waste management facilities there is not anticipated to be any difference in waste management capability and opportunity to minimise, recover and recycle waste between the two dockyards. At this stage a remote site for interim storage has not been identified and subsequently the potential impact of interim storage and segregation/size reduction activities is uncertain at this stage. The potential for effects would depend on the location of the remote site, the scale of development required and the existing waste management infrastructure in place. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites for dismantling would enable faster dismantling of the submarines, creating opportunity to recover recyclable materials from submarines quicker. Notwithstanding this, SDP facilities would need to be provided at both dockyards, which may result in greater volumes of waste arisings associated with construction of SDP facilities within the dockyards when compared to Options 3/4D and 3/4R.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities.	-/+	-/+	-/+	**Potential Effects** It is expected that submarines will be wet towed into the dockyard. Modification of existing facilities and construction of new SDP facilities would generate construction wastes (e.g. concrete, gypsum and other rendering materials, water from dust prevention and any surface run-off, woods and metals, packaging, fuel, diesel and chemical drums), some of which may be hazardous (e.g. asbestos and contaminated soil). Dismantling (RPV removal) and sealing activities would also generate wastes (e.g. shot from blasting, pipes, cables, metals, plant and equipment from the compartments adjacent to the RC, and scrap metal from removal of the hull tiles), including hazardous wastes (e.g. mineral oils, hydraulic fluids, refrigerant gases, asbestos, chromate paints and PCBs). Depending on their type, wastes generated as a result of construction, dismantling and sealing activities may be sent to landfill, recycled or reused. It is anticipated that there would be opportunities to re-use and recycle waste materials. Many of the materials recovered during dismantling could be recycled or reused, such as steel, metals, electric materials and pipework. Furthermore, some of the process materials used may also be recycled, such as the steel shot used in the shot blasting process. Hazardous waste would need to be handled in compliance with relevant waste regulations. Both the Devonport and Rosyth dockyards have existing general waste management facilities that could be utilised *(refer to impacts specific to the Devonport and Rosyth dockyards).* Following removal of the RPV, the hull would be re-sealed and the submarine transported to the ship recycling facility for dismantling. Although unknown at this stage it is anticipated that many of the materials recovered during the process of submarine dismantling would be recycled or reused. For each of the submarines it is estimated that there is likely to be between 4,000 and 7,000 tonnes of materials which can be recycled, depending on the class of submarine. Any recycling and recovery of materials from submarines would contribute positively towards this objective.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+	-/+	-/+	In the case of the PW option, following removal of the RPV the RPV would be segregated, and the resulting LLW and ILW packaged for disposal in the LLWR and the proposed GDF respectively. LLW volumes are estimated to be in the order of between 91 tonnes and 154 tonnes per submarine (between 513 and 4,158 tonnes of LLW in total for 27 submarines), an estimated 4 tonnes to 44 tonnes of which would be disposed of at the LLWR, with the remainder decontaminated and recycled. Long lived ILW volumes are estimated to be between 19 tonnes and 58 tonnes. Once the PW has been placed into interim storage, it is assumed that there would be limited waste arising as the PW would essentially be left in-situ. However, there may be some very small quantities of hazardous waste arising from monitoring activities (e.g. overshoes and protective clothing). SDP activities are not anticipated to affect the capacity of existing waste management systems, as the waste management facilities required to undertake SDP activities would be provided on-site. Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. For the PW option waste generation during construction could therefore be greater than the RPV option but less than the RC option (depending on facility design requirements). In the case of the PW option, the potential benefits from recovery and recycling of wastes could be realised earlier as it involves segregation and size reduction of the RPV prior to interim storage allowing early recovery of all recyclable material in comparison to the other technical options, which defer dismantling until post interim storage. <u>Devonport Dockyard</u> Based on current known information it is understood that the channel arrangements at

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				Devonport dockyard would allow for submarines to be towed directly into and out of the dockyard. There are existing general waste and LLW management facilities at Devonport dockyard, which are understood to be generally sufficient for SDP activities. However, the facilities are not co-located. Optimising the use of existing facilities may therefore require rationalisation to produce an integrated waste management facility with the capacity to treat all LLW arising. Additional craneage may be required at Devonport dockyard to support the receipt area of the waste management facility. The current ETP may also require modification and upgrade to receive liquor from ILW size reduction and conditioning processes. Additional radiochemical analysis equipment and HP monitoring equipment may be required and there would be a requirement for provision of a receipt bay (incoming waste) to receive radiological waste from the submarines.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+	-/+	-/+	To handle LLW from SDP activities a larger LLW lay down area would be required to support submarine dismantling, LLW stands would need to be provided and the Shield Size Reduction Cells would need to be reconfigured. Existing size reduction capability may need to be extended. It is considered that existing LLW conditioning and packaging facilities would need to be optimised, with further waste sorting capacity and shielded buffer storage provided. There are currently no ISO bays at Devonport dockyard, so these would also need to be provided. It is assumed that the existing scrap yard at Devonport dockyard can be utilised, but additional space and equipment for non active waste management may be required. This is dependant on the security declassification strategy provided. Existing ILW facilities at Devonport dockyard are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction / segregation of ILW structures and options for utilising existing buildings are limited. New ILW processing, conditioning and packaging, and storage and consignment facilities would therefore need to be constructed. <u>Rosyth Dockyard</u> Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. There are existing general waste and LLW management facilities at Rosyth dockyard, which are understood to be generally sufficient for SDP activities, assuming that the AWAF at the dockyard would be available for storage, segregation, handling, packaging, and dispatch of radioactive waste. However, modification may be required to the OHT and ETP. It is understood that the existing PETP is suitable only for low quantities of contaminated water and therefore it is assumed that an upgrade would be required. Larger bowser capacity for the holding tanks (receipt and discharge capability would also be required. There is currently no portable plant and jet vacs at the Rosyth dockyard so these facilities would need to be provided. There is currently limited effluent treatment capacity and LLW size reduction capability at Rosyth dockyard. Liquor receipt / storage and disposal is limited to PETP capacity and there are no LLW stands, surface decontamination facilities, size reduction facilities, including Shielded Size Reduction Cells or LLW handling equipment / frames / craneage. To handle LLW from SDP activities these facilities would therefore need to be provided. Existing LLW conditioning and packaging plant at Rosyth dockyard is, however, highly compatible for SDP activities and is assumed to require little modification. It is assumed that the existing scrap yard at Rosyth dockyard can be utilised, but additional space and equipment for non active waste management may be required. This is dependant on the security declassification strategy provided. Existing ILW facilities at Rosyth dockyard are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction / segregation of ILW structures and options for utilising existing buildings are limited. New ILW processing, conditioning and packaging, and storage and consignment facilities would therefore need to be constructed. Options for utilising existing buildings at Rosyth dockyard for ILW

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				management are limited to modification of the AWAF. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+	-/+	-/+	Waste generation associated with construction activities within the dockyards could therefore be greater for Option5D. Notwithstanding this, taking account of the scale of development required, this is not anticipated to result in any significant difference in waste arisings between the two dockyards associated with construction activities within the dockyards. Taking account of existing facility provision, both the Devonport and Rosyth dockyards have waste management facilities that could be utilised for SDP activities, with some modification and new build required. Rosyth dockyard has a better capability for additional LLW processing than Devonport dockyard due to the availability of the AWAF. Further work would be required at Devonport dockyard to optimise the function of the existing waste management facilities; in particular, storage of radioactive waste is limited at Devonport. Both dockyards would require the construction of facilities for ILW management. Notwithstanding this, assuming that both dockyards can accommodate the required waste management facilities there is not anticipated to be any difference in waste management capability and opportunity to minimise, recover and recycle waste between the two dockyards. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that in the case of this combination option as SDP facilities would not be provided at both sites this option would not result in additional wastes from construction of SDP facilities when compared to those combination options proposing the use of both dockyards for dismantling and interim storage.

Options 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities.	- /+/?	- /+/?	- /+/?	**Potential Effects** It is expected that submarines will be wet towed into the dockyard. Modification of existing facilities and construction of new SDP facilities would generate construction wastes (e.g. concrete, gypsum and other rendering materials, water from dust prevention and any surface run-off, woods and metals, packaging, fuel, diesel and chemical drums), some of which may be hazardous (e.g. asbestos and contaminated soil). Dismantling (RPV removal) and sealing activities would also generate wastes (e.g. shot from blasting, pipes, cables, metals, systems and equipment from the RC, and scrap metal from removal of part of the submarine hull), including hazardous wastes (e.g. mineral oils, hydraulic fluids, refrigerant gases, asbestos, chromate paints and PCBs). Depending on their type, wastes generated as a result of construction, dismantling and sealing/packaging activities may be sent to landfill, recycled or reused. It is anticipated that there would be opportunities to re-use and recycle waste materials. Many of the materials recovered during dismantling could be recycled or reused, such as steel, metals, electric materials and pipework. Furthermore, some of the process materials used may also be recycled, such as the steel shot used in the shot blasting process. Hazardous waste would need to be handled in compliance with relevant waste regulations. Both the Devonport and Rosyth dockyards have existing general waste management facilities that could be utilised *(refer to impacts specific to the Devonport and Rosyth dockyards).* Following removal of the RPV, the hull would be re-sealed and the submarine transported to the ship recycling facility for dismantling. Although unknown at this stage it is anticipated that many of the materials recovered during the process of submarine dismantling would be recycled or reused. For each of the submarines it is estimated that there is likely to be between 4,000 and 7,000 tonnes of materials which can be recycled, depending on the class of submarine. Any recycling and recovery of materials from submarines would contribute positively towards this objective. In the case of the PW option, following removal of the RPV the RPV would be segregated, and the resulting LLW and ILW packaged for interim storage and ultimate disposal in the LLWR and the proposed GDF respectively. LLW volumes are estimated to be in the order of between 91 tonnes and 154 tonnes per submarine (between 513 and 4,158 tonnes of LLW in total for 27 submarines), an estimated 4 tonnes to 44 tonnes of which would be disposed of at the LLWR, with the remainder decontaminated and recycled. ILW volumes are estimated to be between 19 tonnes and 58 tonnes. Once the PW has been placed into interim storage, it is assumed that there would be limited waste arising as the PW would essentially be left in-situ. However, there may be some very small quantities of hazardous waste arising from monitoring activities (e.g. overshoes and protective clothing). SDP activities are not anticipated to affect the capacity of existing waste management systems, as the waste management facilities required to undertake SDP activities would be provided on-site. Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. For the PW option, waste generation associated with construction could therefore be greater than the RPV option but less than the RC option (depending on facility design and build requirements). However, in the case of the PW option, the potential benefits from recovery and recycling of wastes could be realised earlier as it involves full dismantling of the RPV and segregation of the ILW and LLW prior to interim storage allowing early recovery of all recyclable material in comparison to the other technical options, which defer segregation/size reduction until post interim storage.
K. Material Assets (Waste Management)	-	-	-	Devonport Dockyard Submarines are likely to be towed to Devonport dockyard for dismantling such that dredging

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	/+/?	/+/?	/+/?	is unlikely to be required. There are existing general waste and LLW management facilities at Devonport dockyard, which are understood to be generally sufficient for SDP activities. However, the facilities are not co-located. Optimising the use of existing facilities may therefore require rationalisation to produce an integrated waste management facility with the capacity to treat all LLW arising. Additional craneage may be required at Devonport dockyard to support the receipt area of the waste management facility. The current ETP may also require modification and upgrade to receive liquor from ILW size reduction and conditioning processes. Additional radiochemical analysis equipment and HP monitoring equipment may be required and there would be a requirement for provision of a receipt bay (incoming waste) to receive radiological waste from the submarines. To handle LLW from SDP activities a larger LLW lay down area would be required to support submarine dismantling, LLW stands would need to be provided and the Shield Size Reduction Cells would need to be reconfigured. Existing size reduction capability may need to be extended. It is considered that existing LLW conditioning and packaging facilities would need to be optimised, with further waste sorting capacity and shielded buffer storage provided. There are currently no ISO bays at Devonport dockyard, so these would also need to be provided. It is assumed that the existing scrap yard at Devonport dockyard can be utilised, but additional space and equipment for non active waste management may be required. This is dependant on the security declassification strategy provided. Existing ILW facilities at Devonport dockyard are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction / segregation of ILW structures and options for utilising existing buildings are limited. New ILW processing, conditioning and packaging, and storage and consignment facilities would therefore need to be constructed. <u>Rosyth Dockyard</u> Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. There are existing general waste and LLW management facilities at Rosyth dockyard, which are understood to be generally sufficient for SDP activities, assuming that the AWAF at the dockyard would be available for storage, segregation, handling, packaging, and dispatch of radioactive waste. However, modification may be required to the OHT and ETP.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	- /+/?	- /+/?	- /+/?	It is understood that the existing PETP is suitable only for low quantities of contaminated water and therefore it is assumed that an upgrade would be required. Larger bowser capacity for the holding tanks (receipt and discharge capability would also be required. There is currently no portable plant and jet vacs at the Rosyth dockyard so these facilities would need to be provided. There is currently limited effluent treatment capacity and LLW size reduction capability at Rosyth dockyard. Liquor receipt / storage and disposal is limited to PETP capacity and there are no LLW stands, surface decontamination facilities, size reduction facilities, including Shielded Size Reduction Cells or LLW handling equipment / frames / craneage. To handle LLW from SDP activities these facilities would therefore need to be provided. Existing LLW conditioning and packaging plant at Rosyth dockyard is, however, highly compatible for SDP activities and is assumed to require little modification. It is assumed that the existing scrap yard at Rosyth dockyard can be utilised, but additional space and equipment for non active waste management may be required. This is dependant on the security declassification strategy provided. Existing ILW facilities at Rosyth dockyard are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction / segregation of ILW structures and options for utilising existing buildings are limited. New ILW processing, conditioning and packaging, and storage and consignment facilities would therefore need to be constructed. Options for utilising existing buildings at Rosyth dockyard for ILW management are limited to modification of the AWAF.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				Comparison of the Options Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Waste generation associated with construction activities within the dockyards could therefore be greater for Option6/8D. Notwithstanding this, taking account of the scale of development required, this is not anticipated to result in any significant difference in waste arisings associated with construction activities within the dockyards between the two sites. Taking account of existing facility provision both the Devonport and Rosyth dockyards have waste management facilities that could be utilised for SDP activites, with some modification and new build required. Rosyth dockyard has a better capability for additional LLW processing than Devonport dockyard due to the availability of the AWAF. Further work would be required at Devonport dockyard to optimise the function of the existing waste management facilities; in particular, storage of radioactive waste is limited at Devonport. Both dockyards would require the construction of facilities for ILW management. Notwithstanding this, assuming that both dockyards can accommodate the required waste management facilities there is not anticipated to be any difference in waste management capability and opportunity to minimise, recover and recycle waste between the two dockyards. At this stage a remote site for interim storage has not been identified and subsequently the potential impact of interim storage activities is uncertain at this stage. The potential for effects would depend on the location of the remote site, the scale of development required and the existing waste management infrastructure in place.
K. Material Assets (Waste Management) Minimise waste arisings, promote reuse, recovery and recycling and minimise the impact of wastes on the environment and communities. *(continued)*	-/+/?	-/+/?	-/+/?	Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage.

A12. Land Use and Materials

12.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on land use and materials. Information is presented for both national and sub-regional levels.

Land use in this context is concerned with the efficient use of land i.e. whether development on previously developed land is encouraged as well sustainable patterns of land use e.g. in relation to the protection of open spaces and green infrastructure. Materials include resources and raw material used during any of the SDP stages.

12.2 Summary of Plans and Programmes

12.2.1 International

The ***World Summit on Sustainable Development (2002)*** in Johannesburg proposed broad-scale principles which should underlie sustainable development and growth including an objective on greater resource efficiency. Reusing previously developed land is a good example of resource efficiency of land.

The conservation of resources is one of the underlying objectives of the ***European Spatial Development Perspective (ESDP) (1999)*** the framework for policy guidance to improve cooperation among community sectoral policies. There also exist a range of legislation in relation to resources.

The ***European Sustainable Development Strategy (2006)*** includes sustainable consumption & production and conservation & management of natural resources as key challenge areas.

12.2.2 National

UK

UK Government ***Sustainable Development Strategy: Securing the Future (2005)*** and the UK's ***Shared Framework for Sustainable Development, One Future – Different Paths (2005)*** includes sustainable Consumption and Production as one of four priorities and considers the five guiding principles:

- living within Environmental Limits;
- ensuring a Strong, Healthy and Just Society;
- achieving a Sustainable Economy;
- using Sound Science Responsibly; and
- promoting Good Governance.

World Class Places : The Government's strategy for improving quality of place (2009) sets out the UK Government's strategy to ensure that all government-funded building programmes, including social housing, schools and health centres, will include improved design standards. The strategy emphasises the influence of the built environment on crime, health, community cohesion, equal access to services, prosperity, wildlife and climate change.

The **Greening Government Commitment** was announced in March 2011, which replaces the SOGE targets after they expired in 2010/11. This framework is intended to reduce government's greenhouse gas emissions and ensure that the public sector is resilient to the impacts of changing climate. The framework also includes challenging targets on waste reduction and recovery, more efficient use of water, and it promotes the protection and enhancement of biodiversity, and positive engagement with the community.

MOD Sustainable Development Strategy (2008) and ***MOD Sustainable Development Report and Action Plan (2008)*** and ***MOD Sustainable Procurement Strategy (2009)*** include objectives on sustainable procurement and material use, such as:

- to become a national leader in sustainable procurement by 2009;
- to embed sustainable procurement principles into all commercial standards, guidance, processes and procurement strategy and policy; and

- to ensure that all new contracts comply with appropriate sustainability standards, such as OGC's 'Buy Sustainable' (previously Quick Wins) minimum requirements and BREEAM/DREAM standards.

England

The concept of green infrastructure is embodied in the Government's Planning Policy Statements PPS1 and PPS12

Planning Policy Statement 1: Delivering Sustainable Development sets out the Government's vision for planning, and the key policies and principles that should underpin the planning system. It sets out that planning should actively seek to bring vacant and underused previously developed land and buildings back into beneficial use.

.PPS1 states that development should ensure an appropriate mix of uses, including the incorporation of green space. ***PPS12: creating strong safe and prosperous communities through spatial planning*** defines green infrastructure as, "a network of multi-functional green space, both new and existing, both rural and urban, which supports the natural and ecological processes and is integral to the health and quality of life of sustainable communities".

PPS 12 requires local planning authorities to assess green infrastructure requirements. In developing their core strategies, local planning authorities should provide supporting evidence of what green infrastructure is needed to enable the amount of development proposed for the area, taking account of its type and distribution. Natural England's Green Infrastructure guidance states that green infrastructure should be provided as an integral part of all new development, alongside other infrastructure such as utilities and transport networks.

PPS 11 sets out the procedural policy on the nature of ***Regional Spatial Strategies (RSSs).*** RSSs provide broad development strategies covering a 15 to 20 year period within every region in England (North East, North West, Yorkshire and Humber, West Midlands, East Midlands, East of England, South East and South West). RSSs incorporate Regional Transport Strategies and inform the preparation of Local Development Documents, Local Transport Plans and regional and sub-regional strategies and programmes that have a bearing on land use activities.

There are Planning Policy Statements that are relevant depending on the land on which development takes place, for example, ***PPS6*** provides objectives for ***Planning for Town Centres*** and ***PPS7*** provides objectives for ***Sustainable Development in Rural Areas.***

Scotland

The Town and Country Planning (Scotland) Act 1997 governs the use and development of land within

Scotland. Covers topics such as development plans, development control, compensation and enforcement.

Choosing our Future: Scotland's Sustainable Development Strategy reflects the five principles found within the UK Sustainable Development Strategy and includes objectives on protecting Scotland's natural heritage and resources.

The ***National Planning Framework*** sets out the spatial strategy for Scotland to 2030. This strategy is underpinned by the following aims:

- to contribute to a wealthier and fairer Scotland by supporting sustainable economic growth and improved competitiveness and connectivity;
- to promote a greener Scotland by contributing to the achievement of climate change targets and protecting and enhancing the quality of the natural and built environments;
- to help build safer, stronger and healthier communities, by promoting improved opportunities and a better quality of life; and
- to contribute to a smarter Scotland by supporting the development of the knowledge economy.

Scotland Rural Development Programme 2007-2013 – The Strategic Plan recognises that rural Scotland should be integral to Scotland's success. The following cross-cutting principles are to guide the approach to the strategy and the Programme itself:

- an integrated approach to policy delivery that combines economic, social and environmental actions;
- flexibility to meet diversity and local distinctiveness across rural Scotland; and
- promotion of sustainability, resilience and vigour in the rural economy, communities and natural heritage.

Wales

The ***One Wales: One Planet, A New Sustainable Development Scheme for Wales Sustainable Development Scheme (2009)*** sets out the Assembly Government's vision of a sustainable Wales and describes specific outcomes that WAG will seek to achieve through its main policies and programmes and processes that it will put in place to ensure its work coherently reflects the goals of sustainable development.

The ***Wales Spatial Plan (2006)*** was further updated to be in keeping with the One Wales, One Planet principles in 2008 and provides the context and direction of travel for local development plans and the work of local service boards. The key themes of the update are:

- building sustainable communities;
- promoting a sustainable economy;
- valuing our environment;
- achieving sustainable accessibility; and
- respecting distinctiveness.

Technical Advice Note 12 (TAN12)(2009) sets out the Assembly Government's land use planning policy in respect of promoting sustainability through good design. . It contains the following objectives for good design:

- movement - promoting sustainable means of travel;
- access- ensuring access for all;
- character - sustaining or enhancing local character, promoting legible development, promoting a successful relationship between public and private space, promoting quality, choice and variety, promoting innovative design;
- community safety - ensuring attractive, safe public spaces and security through natural surveillance;
- environmental sustainability - achieving efficient use and protection of natural resources, enhancing biodiversity and designing for change.

Northern Ireland

A Sustainable Development Strategy for Northern Ireland (2006) is the first Government framework for promoting sustainable development in Northern Ireland. Objectives relevant to land use and materials include:

- to become more resource efficient;
- to make the Northern Ireland public sector a UK regional leader in sustainable procurement;
- to minimise the unsustainable impacts of consumption; and
- to conserve our landscape and manage it in a more sustainable way.

PPS1 (1998) sets out the general principles that the department observes in formulating planning policies, making development plans and exercising control of development whereas ***PPS 21(2010)*** sets out planning policies for development in the Northern Ireland countryside.

The ***Planning Strategy for Rural Northern Ireland (1993)*** establishes the objectives and the policies for land use and development appropriate to the particular circumstances of Northern Ireland. The Planning Strategy is based upon an analysis of the key issues and opportunities relevant to rural Northern Ireland. It considers the complex inter-relationships between town and country and seeks to present a clear vision of the future development of the rural area.

12.2.3 Sub-regional locations

Plymouth

Plymouth City Council's ***Core Strategy Development Plan Document (2007)*** sets out a spatial planning framework for the long term development of the city, ensuring that investment decisions are not made in isolation, but are properly co-ordinated, with a focus on promoting the principles of sustainable development. It has been prepared taking into account the views of all sections of the community and stakeholders, as well as maintaining consistency with national and regional guidance. This constitutes part of the Plymouth Local Development Framework.

Plymouth Housing Strategy 2008 – 2011 and ***Strategic Objective 10*** from Plymouth's ***Core Strategy*** contain targets on number and standard of new homes within the area up to 2026.

Fife

Fife Structure Plan 2006-2026 aims to make Fyfe; ‘an attractive place, with thriving and sustainable communities and a diverse environment’. The rehabilitation and re-use of brownfield land is highlighted as highly relevant as it can greatly improve the appearance and environmental quality of an area and ***Policy BL1*** sets out the circumstances for such development. These developments will be supported where the new use;

- is appropriate to and compatible with the surrounding area;
- provides environmental/community/economic benefits;
- can be achieved in an environmentally acceptable and sustainable manner; and,
- accords with other Structure and Local Plan policies.

Also included within the document is the target to provide 35,200 new homes between 2006 and 2026.

12.3 Overview of the Baseline

12.3.1 National

UK

The UK covers an area of 2,472,900 hectares (242,514km^2). England comprises the largest land area in the UK, covering an area of 13,028,100 hectares (130,281km^2). The smallest land area in the UK is Northern Ireland, which covers an area of 1,357,600 hectares (13,576km^2).

Average population density of UK is 247 people per km^2.

Table 12.1 shows land cover in the UK as it stood in 2007 and shows that arable and horticulture and improved grassland are the most common land cover types in the UK, constituting 20.4% and 19.9% of total land area in the UK respectively.

Table 12.1 Estimated area of Broad Habitats in the UK in 2007[224]

Land Type	'000 hectares	% land area
Broadleaved, mixed and yew woodland	1406	6.2
Coniferous woodland	1319	5.8
Linear features	496	2.2
Arable and horticulture	4608	20.4
Improved grassland	4494	19.9
Neutral grassland	2176	9.6
Calcareous grassland	57	0.3
Acid grassland	1589	7.0
Bracken	260	1.1
Dwarf shrub heath	1343	5.9
Fen, Marsh, Swamp	392	1.7
Bog	2232	9.9
Standing open waters[1]	204	0.9
Rivers and streams[1]	58	0.3
Montane	42	0,2
Inland rock	84	0.4
Built-up areas and gardens	1323	5.8
Other land	113	0.5
Unsurveyed land[2]	522	2.3

[224] ONS (2009) http://www.statistics.gov.uk/STATBASE/Expodata/Spreadsheets/D5325.xls (accessed 22.10.2009)

Land Type	'000 hectares	% land area
Total[3]	**22627**	

The MOD's built estate covers approximately 80,000 hectares, with at least 45,000 buildings (including single living units) and approximately 52,000 houses. The MOD owns or manages an overall stock of 70,000 houses worldwide and 160,000 single living units, spread across more than 200 sites in 16 countries.

The MOD is the third largest landowner in the UK with a diverse estate of some 238,000 hectares (1% of the UK mainland) valued at some £15.3 billion. 79% of this is in England, 11% in Scotland, 9% in Wales and 1% in Northern Ireland. [225]

Since 2003 the MOD delivered 35,000 modernised Single Living Accommodation bed spaces it is anticipated that a further 21,000 bed spaces will be delivered by 2013, a total of 56,000 overall.

England

The average population density of England is 385 people per km^2.[226]

Table 12.2 shows land cover in England as it stood in 2007 and highlights arable and horticulture and improved grassland as the most common land use covers (covering 30.4% and 21.7% of total land in England respectively).

Table 12.2 Land Cover in England in 2007[227]

England Land Cover 2007	'000 ha	% area
Broadleaved, Mixed and Yew Woodland	981	7.4
Coniferous Woodland	257	1.9
Boundary and Linear Features	353	2.7

225 MOD, Stewardship Report on the Defence Estates, 2008-09, http://www.mod.uk/NR/rdonlyres/F9E34976-9E39-4E0D-BADA-157975DF2118/0/stewardshiprpt200809v7.pdf
226 Office of National Statistics, http://www.statistics.gov.uk/geography/uk_countries.asp
227 ONS (2009) http://www.statistics.gov.uk/STATBASE/Expodata/Spreadsheets/D5325.xls (accessed 22.10.2009)

England Land Cover 2007	'000 ha	% area
Arable and Horticulture	4,002	30.4
Improved Grassland	2,856	21.7
Neutral Grassland	1,453	11.0
Calcareous Grassland	30	0.2
Acid Grassland	396	3.0
Bracken	91	0.7
Dwarf Shrub Heath	331	2.5
Fen, Marsh and Swamp	117	0.9
Bog	140	1.1
Standing Open Water and Canals	97	0.7
Rivers and Streams	29	0.2
Built-up Areas and Gardens	1,038	7.9
Other land	580	4.4
Unsurveyed Urban Land	428	3.5
TOTAL	13,180	100

In 2008, there was an estimated 63,750 hectares of previously-developed land in England, up from 2.6% from 62,130 hectares in 2007. An estimated 32,400ha of previously-developed land was vacant or derelict, 51% of the total. The remaining 31,350ha was in use but with potential for redevelopment.[228]

Scotland

Scotland covers an area of 7,792,500ha (77,925km^2) [229] and has an average population density of 65

[228] Previously Developed Land that may be Available for Development: Results from the 2008 National Land Use Database of Previously-Developed Land in England, Homes and Communities Agency, February 2010, http://www.homesandcommunities.co.uk/nlud-pdl-results-and-analysis.htm
[229] Office of National Statistics, http://www.statistics.gov.uk/geography/uk_countries.asp

people per km^2.

Table 12.3 shows land cover in Scotland as it stood in 2007, and highlights that bog is the most common land use in Scotland (constituting 25.6% of the total land area).

Table 12.3 Land Cover in Scotland in 2007[230]

Scotland Land Cover 2007	'000 ha	% area
Broadleaved, Mixed and Yew Woodland	251	3.1
Coniferous Woodland	956	11.9
Boundary and Linear Features	95	1.2
Arable and Horticulture	534	6.6
Improved Grassland	907	11.2
Neutral Grassland	461	5.8
Calcareous Grassland	26	0.3
Acid Grassland	983	12.3
Bracken	132	1.6
Dwarf Shrub Heath	894	11.1
Fen, Marsh and Swamp	239	3.0
Bog	2,044	25.6
Standing Open Water and Canals	89	1.1
Rivers and Streams	21.3	0.3
Built-up Areas and Gardens	153	1.9
Other land	74	0.9
Unsurveyed Urban Land	38	0.5

[230] Countryside Survey 2007, http://www.countrysidesurvey.org.uk/reports2007.html

Scotland Land Cover 2007	'000 ha	% area
TOTAL	8,012	100

In 2009, there was an estimated 10,863 hectares of derelict and urban vacant land in Scotland, of which 2,640 hectares (24%) were urban vacant and 8,224 hectares were derelict (76%).[231]

Wales

Wales covers an area of 2,073,200ha (20,732km^2)[232] and there is an average population density 141 people per km^2.

Table 12.4 shows land cover in Wales as it stood in 2007, and highlights that improved grassland is the most common land use (constituting 34.4% of the total land area in Wales).

Table 12.4 Land Cover in Wales in 2007[233]

Wales Land Cover 2007	'000 ha	% area
Broadleaved, Mixed and Yew Woodland	174	8.2
Coniferous Woodland	106	5
Linear features[234]	48	2.2
Arable and Horticulture	73	3.4
Improved Grassland	730	34.4
Neutral Grassland	263	12.4

[231] Scottish Vacant and Derelict Land Survey 2009, Scottish Government, January 2010, http://www.scotland.gov.uk/Publications/2010/01/26135819/0
[232] Office of National Statistics, http://www.statistics.gov.uk/geography/uk_countries.asp
[233] Country Survey for Wales (2007) http://www.countrysidesurvey.org.uk/sites/default/files/pdfs/reports2007/wales2007/CS-Wales-Results2007-Chapter08.pdf
[234] Linear features were largely mapped as lengths except where >5m wide and >80m long i.e. above the Minimum Mappable Unit. Consequently, Linear Feature areas tend to comprise land occupied by larger roads and the railway network.

Wales Land Cover 2007	'000 ha	% area
Calcareous Grassland	1.2	0.1
Acid Grassland	211	9.9
Bracken	37	1.8
Dwarf Shrub Heath	117	5.5
Fen, Marsh and Swamp	36	1.7
Bog	48	2.3
Standing Open Water	5	0.3
Rivers and Streams	6	0.3
Montane	0.1	0.004
Inland Rock	8	0.4
Built-up Areas and Gardens	132	6.2
Other land	111	5.2
Unsurveyed Urban Land	15	0.7
TOTAL	2121	100

Northern Ireland

Northern Ireland covers an area of 1,357,600ha (13,576km^2) and the average population density of Northern Ireland is 125 people per km^2.[235]

Table 12.5 shows land cover in Northern Ireland as it stood in 2007, and highlights that improved grassland is the most common land use (constituting 40.47%% of the total land area in Northern Ireland).

[235] Office of National Statistics, http://www.statistics.gov.uk/geography/uk_countries.asp

Table 12.5 Land Cover in Northern Ireland in 2007 [236]

Northern Ireland Land Cover 2007	'000 ha	% area
Broadleaved, Mixed and Yew Woodland	81,699	5.77
Coniferous Woodland	60,617	4.28
Roads / Tracks & Hard verge	30,951	2.19
Arable and Horticulture	48,917	3.46
Improved Grassland	573,010	40.47
Neutral Grassland	231,116	16.32
Calcareous Grassland	1,802	0.13
Acid Grassland	10,369	0.73
Bracken	2,645	0.19
Dwarf Shrub Heath	16,751	1.18
Fen, Marsh and Swamp	47,255	3.34
Bog	160,902	11.36
Standing Open Water and Canals	61,332	4.33
Rivers and Streams	5,495	0.39
Montane*	<735	/
Inland Rock	5,450	0.39
Built-up Areas and Gardens	74,098	5.23
Supralittoral Rock	1,581	0.11
Supralittoral Sediment	1,995	0.14

[236] Countryside Survey for Northern Ireland 2007, http://www.doeni.gov.uk/niea/nics2007_broad_habitat_change_1998-2007_amended.pdf

Northern Ireland Land Cover 2007	'000 ha	% area
TOTAL	1,415,986	100
* Montane has not yet been surveyed, although the area of habitat is thought to be no greater than 735ha (the area of the land classification stratum in which it is located).		

12.3.2 Sub-regional locations

Plymouth

The total area in Plymouth is 83.2 km² and the major land uses in 2005 were as follows;[237]

- 6.5km² domestic buildings;
- 3km² non-domestic buildings;
- 9.5km² roads;
- 17.3 km^2 domestic gardens;
- 35.1km^2 greenspace;
- 4km² water; and
- 7.8km² other.

In 2007, there were a total of 231ha of previously developed land that may be available for redevelopment. (136ha of derelict and vacant land and buildings and 95ha of land currently in use).[238]

The average population density in Plymouth was 3000 per km² in 2002.[239]

[237] ONS, Key Figures for Physical Environment, http://www.neighbourhood.statistics.gov.uk/dissemination/LeadKeyFigures.do?a=3&b=276837&c=plymouth&d=13&e=8&g=401185&i=1001x1003x1004&m=0&r=1&s=1249995511942&enc=1
[238] National Land Use Database, Previously-developed land that may be available for Development: England 2007 http://www.communities.gov.uk/publications/corporate/statistics/previouslydevelopedland2007
[239] ONS, http://www.statistics.gov.uk/STATBASE/ssdataset.asp?vlnk=7662

Fife

The situation in Fife reflects the overall Scottish trend which is one of increasing urbanisation with 1,403 hectares of agricultural land given over to roads, housing or industry in 2002–2003 (a 140% increase since 1989-1990).[240]

The area of derelict and vacant land in Fife has fluctuated between 1999 to 2007. Overall, the area of derelict land has changed little from 772ha to 757ha between 1999 and 2007. However, the number of derelict sites has increased from 96 to 159 from 1999 to 2006. The area of vacant land has decreased more significantly, from 203ha to 114ha between 1999 and 2006. The number of vacant sites also decreased from 80 to 68 in the same time period.

Between 2002 and 2009, the area of vacant land increased from 80ha to 83ha, however this has declined following greater increases over the years between 2002 and 2008.

Between 2002 and 2009, the area of derelict land increased from 528ha to 731ha.[241]

12.4 Existing problems

12.4.1 National

UK

5.6% of UK land is currently classed as 'built up.' Development targets in Regional Spatial Strategies, which placed significant pressure for economic development and housing on undeveloped land, have now been scrapped; nevertheless, development pressure remains, and it is not expected that previously-developed land will be able to fully deliver the UK's future needs. This will continue to place development pressures in rural areas and the urban fringe.

When greenfield land is used for development, it is likely to result in the permanent loss of that land from other uses such as agriculture. There are similar pressures to build across each of the UK administrations, however the details differ slightly between each.

The State of the Natural Environment report[242] notes that within rural England, the area of developed land has increased by about 4% since 1990, largely at the expense of agricultural land and that between 1998 and 2003 substantial greenfield development has occurred near many urban areas, notably at key

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[240] Fife Council, Single Outcome Agreement, 2008-2011, http://www.improvementservice.org.uk/library/577-single-outcome-agreements/666-single-outcome-agreements-2008-2011/view-category/-1/
[241] Scottish National Statistics, http://www.sns.gov.uk
[242] Natural England (2008) http://www.naturalengland.org.uk/publications/sone/default.aspx

growth points, but also in former coalfield belts. It continues that the pace of development within England is increasing, particularly for housing in response to demand and a historic shortfall in housing provision and that this is expected to have a dramatic effect on a large part of central and southern England though the series of Growth Areas and Growth Points.

More than 80%of Scotland's population live in urban areas, and yet only 6% of land in Scotland is urban; this leads to a high monetary value being placed on urban land. There are also only relatively small areas of prime agricultural land in Scotland. [243]

Wales has a very small proportion of land that is classified as 'best and most versatile' agricultural land in Wales which increases the importance to conserve it.[244]

The main pressure on land in Northern Ireland is development (including housing, industrial and recreational), infrastructure, extraction industries, agriculture and forestry, and tourism. Considerable new housing development has taken place on urban fringes as well as towns and villages. There is a need to move towards redevelopment of brownfield sites in order to relieve pressure on the development of Greenfield (previously undeveloped land).[245]

The Defence Estate strategy and recent Strategic Defence and Security Review are driving significant and progressive reductions in the amount of MOD-owned land across the UK. This may impact the availability of military land for SDP activity.

12.4.2 Sub-regional locations

Consistent with the national trends, within the sub-regional baselines, there has been an increase in the location of development on previously developed land. No data was found on any particular land use or materials supply issues.

[243] Getting the Best from Our Land: A Draft Land Use Strategy for Scotland, January 2010, http://www.scotland.gov.uk/Topics/Environment/Countryside/Landusestrategy
[244] Environment Strategy for Wales, Welsh Assembly Government, May 2006, http://wales.gov.uk/topics/environmentcountryside/epq/envstratforwales/strategy/?lang=en
[245] 'Our Environment, Our Heritage, Our Future' State of the Environment Report for Northern Ireland, Department of the Environment, March 2008, http://www.ni-environment.gov.uk/index/about-niea/state_of_the_environment/state_of_the_environment_report.htm

12.5 Likely evolution of the baseline

12.5.1 National

UK

The estimated broad habitat type in the UK and how it has changed from 1984 to 2007 was calculated by the Office of National Statistics[246] and is shown in Table 12.6. It shows that the area of land cover under arable and horticulture has decreased by 9.1% between 1998 and 2007. The area of grassland land cover has generally increased with improved grassland increasing by 5.7%. Built-up areas and gardens have increased by 3.4% between 1998 and 2007.

Table 12.6 Estimated area of Broad Habitats in the UK in 1984, 1990, 1998 and 2007

Land Type	1984	1990	1998	2007	% change between 1998 and 2007
Broadleaved, mixed and yew woodland	1317	1343	1328	1406	5.9
Coniferous woodland	1243	1239	1386	1319	-4.8
Linear features	491	581	511	496	-2.9
Arable and horticulture	5283	5024	5067	4608	-9.1
Improved grassland	5903	4619	4251	4494	5.7
Neutral grassland	467	1669	2007	2176	8.4
Calcareous grassland	75	78	61	57	-6.6
Acid grassland	1476	1821	1503	1589	5.7
Bracken	439	272	315	260	-17.5
Dwarf shrub heath	1388	1436	1299	1343	3.4
Fen, Marsh, Swamp	428	427	426	392	-8.0
Bog	2303	2050	2222	2232	0.5
Standing open waters[1]	284	200	196	204	4.1
Rivers and streams[1]	70	70	65	58	-10.8
Montane	41	n/a	41	42	2.4

[246] http://www.statistics.gov.uk/STATBASE/Expodata/Spreadsheets/D5325.xls (accessed 22.10.2009)

Land Type	1984	1990	1998	2007	% change between 1998 and 2007
Inland rock	38	76	111	84	-24.3
Built-up areas and gardens	1268	1266	1279	1323	3.4
Other land	n/a	57	107	113	n/a
Unsurveyed land[2]	n/a	522	522	522	n/a
Total[3]	**22514**	**22632**	**22601**	**22627**	

It is not known whether the decrease in arable and increase in improved grassland is likely to continue at the same rate in the future although it does seem likely that the amount of developed land and garden will continue to increase as some development will inevitably take place on greenfield land.

With the MOD all new build and major refurbishment construction projects will be designed to achieve an excellent rating against the Defence Related Environmental Assessment Methodology (DREAM), the Building Research Establishment's Environmental Assessment Method (BREEAM) or equivalent (SOGE mandate). [247]

England

Between 2002 and 2007, the total amount of previously-developed land in England has declined by 6%, vacant and derelict land has declined by 17.5% while land currently in use with potential for redevelopment has increased by 12%.[248]

There have also been changes in the changes to land use related to broad habitat types. Between 1998 and 2007 in England there was a significant increase in the area of Broadleaved Woodland (5.8%), Neutral Grassland (12.6%), Dwarf Shrub Heath (15.1%) and Standing Open Water and Canals (5.3%6). The increase in the area of Dwarf Shrub Heath between 1998 and 2007 followed a decrease in area between 1990 and 1998. The increase in the area of Standing Open Water and Canals6 recorded in England between 1998 and 2007, continued the increases recorded by Countryside Survey since 1990.[249]

[247] MOD Sustainable Development Report and Action Plan 2008, http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/HealthandSafetyPublications/SSDCD/SustainableDevelopmentPolicy/SustainableDevelopmentStrategyReportsAndActionPlans.htm
[248] Communities and Local Government 2008
[249] Countryside Survey for England (2007) http://www.countrysidesurvey.org.uk/sites/default/files/pdfs/reports2007/england2007/CS-England-Results2007-Chapter02.pdf

On the other hand, there was a significant decrease in the area of Arable and Horticulture Broad Habitat (8.8%) in England across the same period. No statistical change in extent was detected in the Coniferous Woodland, Improved Grassland, Bracken, Bog, Fen, Marsh and Swamp and Calcareous Grassland Broad Habitats in England between 1998 and 2007.

Scotland

In Scotland, since 2002 there has been a total increase of 217ha of derelict and urban vacant land, from 10,646ha in 2002 to 10,863ha in 2009. This is attributable to the land that has been brought back into productive use or removed due to naturalisation being balanced by a small number of large sites falling out of use. Since 2002, an average of 580ha of derelict and urban vacant land was brought back into use each year. The 2009 survey recorded 384ha of derelict and urban vacant land being reused since 2008.

The area of Broadleaved Woodland, Improved Grassland and Acid Grassland Broad Habitats increased by 19.5% in Scotland between 1998 and 2007. There was a corresponding decrease of 7.1% in the area of Coniferous Woodland. The area of the Arable and Horticulture Broad Habitat decreased by 13.6% between 1998 and 2007. There was a corresponding increase of 9.1% in the area of Improved Grassland, but no significant increase in the area of Neutral Grassland across Scotland as a whole. The changes in the areas of Broad Habitats in Scotland reflect short-term influences, such as agricultural economics, and medium term influences, such as woodland planting and harvesting.[250]

The Scottish Government are in the process of developing a Land Use Strategy (draft consultation version is available). The Strategy will set out a vision and long term objectives for an integrated approach to sustainable land use in Scotland.[251]

Wales

In Wales, between 1998 and 2007 the area of built land has increased by 12.5%. Most Broad Habitats did not change significantly in area between 1998 and 2007 when averaged across Wales as a whole. However, a number of statistically significant changes in area have been noted between 1998 and 2007. In the lowland zone of Wales Broadleaved, Mixed and Yew Woodland increased, and in the upland zone, Arable and Horticultural Land increased, Neutral Grassland decreased and Acid Grassland increased. The possible drivers of these changes are unknown and require further research.

No baseline data has been identified in relation to previously developed land in Wales and therefore

[250] Countryside Survey 2007, http://www.countrysidesurvey.org.uk/reports2007.html
[251] Getting the Best from Our Land: A Draft Land Use Strategy for Scotland, January 2010, http://www.scotland.gov.uk/Topics/Environment/Countryside/Landusestrategy

trends could not be established. However, similar to National Trends, it is expected that current trend in land use is generally towards increased development on previously-developed land.

Northern Ireland

In Northern Ireland, the most recent Countryside Survey showed that semi-natural habitat continues to decline, although the rate of loss has slowed from 1998. Agricultural land use and rural building continue to be the main processes resulting in habitat loss. From 1998 to 2007 the total area of Urban/Built-up Areas has increased by over 30%.[252] There has been a reduction in habitat diversity throughout lowland and upland landscapes, probably as a result of agricultural intensification. Woodland and scrub habitat, however, has increased as a result of conifer and woodland planting.[252]

No baseline data has been identified in relation to previously developed land in Northern Ireland and therefore trends could not be established. However, similar to National Trends, it is expected that current trend in land use is generally towards increased development on previously-developed land.

12.5.2 Sub-regional locations

Plymouth

Plymouth's City Council aims to deliver 24,500 dwellings between 2006 – 2026[253] and for 80% of new dwellings to be provided on previously developed land.[254] 130ha of employment land aim to be delivered by the Council between 2006 - 2026. [255]

HM Naval Base Devonport will be the main operating base for Amphibious Shipping, Survey and Hydrographic vessels, for the Type 22 frigates and, for at least the next five years, for seven of the Type 23 frigates. [256] Devonport will also continue to provide world class sea training through Flag Officer Sea Training, will undertake Fleet Time Engineering support for base-ported ships and for visiting sea training vessels and will also retain and, subject to commercial negotiations, enhance its position as the centre of excellence for Surface Ship and Submarine Deep maintenance activity. Subject to ongoing approvals, Devonport will be developed as the centre of specialisation for Amphibious Operations by moving 1 Assault Group Royal Marines, including the Landing Craft of 10 training Squadron and 539 Assault Squadron currently at Poole and Turnchapel, to Devonport.

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[252] 'Our Environment, Our Heritage, Our Future' State of the Environment Report for Northern Ireland, Department of the Environment, March 2008, http://www.ni-environment.gov.uk/index/about-niea/state_of_the_environment/state_of_the_environment_report.htm
[253] Plymouth City Concil LDF Core Strategy
[254] Plymouth City Council, Core Strategy Development Plan Document – Strategic Objective 10 (Delivering Adequate Housing Supply)
[255] Habitat Regulations Assessment of the Plymouth City Council, Millbay & Stonehouse Area Action Plan, Screening Report, May 2007, http://www.plymouth.gov.uk/070514,rpt,millbayaap_hra_screening_final.pdf
[256] Maritime Change Program, Minister of Defence Update, May 2009, http://www.theyworkforyou.com/wms/?id=2009-05-06b.16WS.1

Fife

Fife has a growing population which has reached at least 375,000 and is still expanding. The General Register Office for Scotland (GROS) predicts that Fife's population will grow by 10.1% to 398,608 in 2033.[257]

The situation in Fife reflects the overall Scottish trend which is one of increasing urbanisation with 1,403 hectares of agricultural land given over to roads, housing or industry in 2002–2003 (a 140% increase since 1989-1990).[258]

The area of derelict and vacant land in Fife has fluctuated between 1999 to 2007. Overall, the area of derelict land has changed little from 772ha to 757ha between 1999 and 2007. However, the number of derelict sites has increased from 96 to 159 from 1999 to 2006. The area of vacant land has decreased more significantly, from 203ha to 114ha between 1999 and 2006. The number of vacant sites also decreased from 80 to 68 in the same time period.

Between 2002 and 2009, the area of vacant land increased from 80ha to 83ha, however this has declined following greater increases over the years between 2002 and 2008. During the same period, the area of derelict land increased from 528ha to 731ha.[259]

Fife Council indicates the district is to provide 35,200 new homes between 2006 and 2026.[260]

12.6 Assessment objective, guide questions and significance

The objective and guide questions related to cultural heritage that have been used in the assessment of the effects of the SDP are set out in Table 12.7, together with reasons for their selection.

[257] General Register Office for Scotland, 2008-based Population Projections.
[258] Fife Council, Single Outcome Agreement, 2008-2011, http://www.improvementservice.org.uk/library/577-single-outcome-agreements/666-single-outcome-agreements-2008-2011/view-category/-1/
[259] Scottish National Statistics, http://www.sns.gov.uk
[260] Fife Council, Fife Structure Plan 2006-2026

Table 12 .7 Approach to assessing the effects of SDP on land use and materials

Objective/guide question	Reasoning
Objective: Contribute to the sustainable use of land and natural and material assets.	The SEA Directive requires likely effects on resources be taken into effect in the Environmental Report. The Planning and Compulsory Purchase Act 2004 and the Planning Act 2008 (and draft National Planning Policy Framework) concerns the contribution of spatial planning towards sustainable development.
Will the SDP Proposals change patterns of land use on or around SDP sites?	Key policies under PPS1 are that planning should actively seek to bring vacant and underused previously developed land and buildings back into beneficial use.
Will the SDP Proposals affect any existing or proposed redevelopment/regeneration programmes?	Key policies under PPS1 are that planning should actively seek to bring vacant and underused previously developed land and buildings back into beneficial use.
Will the SDP Proposals lead to the loss of undeveloped land or green spaces?	PPS1 and PPS12 seek to ensure that green infrastructure is provided and that developments should ensure the incorporation of green space.
Will the SDP Proposals increase the burden on limited natural resources such as aggregates or wood?	Conservation of resources and living within environmental limits are underlying objectives of several the international policies such as European Spatial Development Perspective, and national policy, such as Framework for Sustainable Development
Will the SDP Proposals promote the use of sustainable design and construction practices and help the government achieve its targets for the quality of built environments?	Government strategy such as World Class Places (2009) highlights the need influence of the built environment on other SEA objectives, such as climate change, biodiversity, health and wellbeing and quality of life.
Will the SDP Proposals make best use of existing infrastructure and resources?	Use of existing infrastructure and resources will decrease the total resources required and will increase efficiency. Key policies under PPS1 are that planning should actively seek to bring vacant and underused previously developed land and buildings back into beneficial use.

Table 12.8 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the land use and materials objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 12.8 Approach to determining the significance of effects on land use and materials

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option would not use any undeveloped land, but would reclaim and redevelop a significant area of previously-developed or derelict land. • Option makes best use of existing infrastructure and resources (e.g. buildings and other facilities on site). • Option would allow for innovative sustainable design and construction, so that resource use is minimal. This may include, for example, the adoption water efficient technologies, on-site renewable energy provision etc).
+	Positive	• Option would not use any undeveloped land, but would reclaim previously-developed or derelict land. • Option makes best use of existing infrastructure and resources (e.g. buildings and other facilities on site). • Option would allow for innovative sustainable design and construction, so that resource use would be reduced.
0	No (neutral effects)	• Option would not involve significant loss of any undeveloped or developed land.
-	Negative	• Option would lead to the development of undeveloped land, or land that has reverted to a 'wild' state. • Option may increase the risk of accidental discharge of non-radiological contaminants leading to contamination of land in and adjacent to SDP sites. • Option will undermine the attractiveness of the area, leading to an increase in vacant land for example, due to concerns related to the radioactive element of SDP. • Option will meet minimum design and construction standards. • Option will require the limited use of natural resources during construction and operational stages.
--	Significant negative	• Option would not develop derelict or previously-developed land, but would develop a significant area of undeveloped land/ land that has reverted to a 'wild' state. • Option may result in the incremental development of greenfield land around SDP sites (e.g. as businesses look to make use of infrastructure provided to accommodate SDP facilities. • Option is likely to undermine existing or proposed redevelopment/regeneration programmes (e.g. due to the loss of key regeneration sites to accommodate SDP proposals). • Option may increase the risk of accidental discharge of radiological and non-radiological contaminants leading to contamination of land in and adjacent to SDP sites which could restrict the use of such land. • Option will undermine the attractiveness of the area, leading to an increase in vacant land for example, due to concerns related to the radioactive element of SDP. • Option will not meet minimum design and construction standards. • Option is likely to require a significant volume of natural resources and result in the direct loss of resources (e.g. through clearance of woodland and development of high grade agricultural land).
?	Uncertain	• From the level of information available the impact that the option would have on this objective is uncertain.

12.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the land use and materials objective. **Table 12.3** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 12.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 12.4** below.

Table 12.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than 'greenfield' sites, although it is recognised that 'brownfield' land can be important for

Category	Assumption Description
	conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m$^{2.}$ Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2 . As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average). • It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine

Category	Assumption Description
	• It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since breaking a cleared submarine is little different to breaking a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be transported from the initial dismantling facility to the interim storage facility by sea, rail or

Category	Assumption Description
	road. • **Fully-packaged ILW -** It is assumed that each 3m^3 container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Table 12.3** are considered in-turn below.

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities

Land Use and Materials

Option 1: Develop a Greenfield Site for Submarine Dismantling

Assessment of Effects:

Under Option 1, all development would take place on greenfield land i.e. land not previously subjected to industrial development such as farmland, parkland, disused quarry or mine works. It is therefore assumed that most or all infrastructure to support the development and operation of SDP facilities would be required including, for example, roads and rail heads. Although the total land take associated with this option is unknown, given the significant extent of greenfield land likely to be required under this option, it is considered that development of the facilities would significantly alter patterns of land use and that a significant area of undeveloped land or green space would be required to accommodate both the dismantling/size reduction facilities and associated ancillary uses/infrastructure. There is also potential for development of the greenfield site to lead to the incremental development of land adjacent to the facility due to the creation of new transport infrastructure which may make the location attractive for other business or activities. This could lead to the piecemeal loss of further greenfield land over time however, any such change of land use would need to be consistent with the planning policy requirements set out in the spatial plan of the local planning authority. Conversely, there is potential for the radioactive waste element of the site's operation to be viewed as undermining the attractiveness of the area which may lead to disinvestment and an increase in vacant land. However, this is highly dependent on how the facilities are perceived.

Development of the scale proposed under this option is expected to require a significant volume of natural resources to support construction, such as sand, rock, gravel, metals and wood. Depending on the location of the site, there is also potential for development to directly lead to the loss of resources for example, through the clearance of woodland, development on agricultural land or use of a disused quarry or mine to accommodate the facilities. However, it is envisaged that there is an opportunity to ensure that all new buildings and structures use sustainable design and construction practices which may help mitigate to an extent negative effects with respect to the use of natural resources.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities and infrastructure (e.g. roads, car parking, security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale of construction would be reduced under RC/RPV storage options in the short term, it is expected that the area of greenfield land and volume of natural resources required for development would also be reduced relative to PW storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further land take and natural resource use would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.

Proposed Mitigation / Enhancements Measures:

- The best and most versatile land should be avoided where possible and early consultation should be undertaken with the landowners/tenant farmers to minimise disruption to existing land uses.
- Avoid locations where development may have a negative effect in relation to natural resources such as mineral deposits.
- The siting of the buildings and infrastructure should aim to minimise the need for additional access roads and the loss of noted landscape features or views.
- Land use requirements should be carefully considered to strike a balance between minimisation of land take (and therefore effects on existing land use) and incorporation of suitable measures required for mitigation or enhancement, notably landscape screening.
- Consider the use of dredging/excavation materials in the construction of the facility and ancillary uses/infrastructure.
- Promote high standards of design and construction including the use of recyclates to minimise resource use.

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities Land Use and Materials	
Summary: Option 1 has been assessed as having a significant negative effect in relation to this objective due to the significant area of greenfield land likely to be required for both development of SDP facilities and all ancillary uses/infrastructure. The development is likely to lead to the direct loss of such land and will affect existing uses (whether agricultural or local amenity). The development could lead to the incremental loss of adjacent sites, due to the consenting of further piecemeal development over time, making best use of the new transport infrastructure required for the site. Construction of SDP facilities will require a significant volume of natural resources although there will be an opportunity to adopt sustainable design and construction practices and reuse existing buildings/demolition waste which is expected to help mitigate these effects. Under RC/RPV storage options construction of the size reduction facility would be delayed and therefore, the area of greenfield land and volume of natural resources required for development would be reduced relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, further land take and natural resource use would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.	--
Option 2: Develop Brownfield Site for Submarine Dismantling	
Assessment of Effects: Depending on the previous/existing use of the site taken forward for development, it is envisaged that existing patterns of land use would be altered. This may have a positive effect in relation to this objective as previously developed land would be utilised which is consistent with the objectives of national planning policy and would provide an opportunity to restore land back to viable economic use. However, there is potential for development of SDP facilities to have a negative effect in relation to land use patterns around SDP sites. This primarily reflects the radioactive waste element of site's operation and the potential for the development to be viewed as undermining the attractiveness of the area which may lead to disinvestment and an increase in vacant land. However, this is dependent on how the facilities are perceived. As development under this option would be on brownfield land, it is assumed that the loss of undeveloped land/green space would be minimal. Development of the scale proposed under this option is expected to require a significant volume of natural resources to support construction. However, this option presents an opportunity to ensure that all new buildings and structures use sustainable design and construction practices which may help mitigate any negative effects with respect to the use of natural resources. In addition, it may be possible to reuse some existing buildings on site/recycle demolition arisings, thereby reducing the requirement for natural resources. As development is to take place on previously developed land, it is not expected that construction would result in the direct loss of natural resources such as woodland or agricultural land. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on a brownfield site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities (e.g. security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage. As the scale of construction would be reduced under RC/RPV storage options in the short term, it is expected that the volume of natural resources required for development would also be reduced relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further natural resource use would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.	

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities Land Use and Materials	
Proposed Mitigation / Enhancements Measures: • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Under this option, the use of a brownfield site represents a positive contribution to the objective through the reuse of previously redundant (and non economically productive) land, consistent with current planning policy. However, the radioactive waste element of site's operation and the potential for the development of facilities to be viewed as undermining the attractiveness of the area which may lead to disinvestment and an increase in vacant land although this is highly dependent on how the facility is perceived. Construction of SDP facilities will require a significant volume of natural resources although there will be an opportunity to adopt sustainable design and construction practices and reuse existing buildings/demolition waste which is expected to help mitigate these effects. Under RC/RPV storage options construction of the size reduction facility would be delayed and therefore, the volume of natural resources required for development would be reduced relative to the Packaged Waste storage option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further natural resource use would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.	**+/-**
Option 3: Develop Licensed/Authorised Site for Submarine Dismantling	
Assessment of Effects: Option 3 would utilise existing sites Licensed or Approved by the UK nuclear regulators. It is assumed that the area of the site to be used would not be characterised as a redundant brownfield site and that the ancillary infrastructure required for Options 1 and 2 would be not be needed for Option 3, reducing the development footprint such that changes to existing patterns of land use would be minimal. However, there is potential for development of SDP facilities to have a negative effect in relation to land use patterns around SDP sites. This primarily reflects the radioactive waste element of site's operation and the potential for the development to be viewed as undermining the attractiveness of the area which may lead to disinvestment and an increase in vacant land. However, given that activities involving radioactive or nuclear activities will already be taking place in the adjacent land this is considered unlikely. It is assumed that the site would already be developed and the amount of greenfield land and green space required to support development would be minimal. Development will require natural resources to support construction. However, this option will increase the opportunities to make best use of existing infrastructure thereby reducing the volume of natural resources required to support development. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on an existing Licensed/Authorised site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities. A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage. As the scale of construction would be reduced under RC/RPV storage options in the short term, it is expected that the volume of natural resources required for development would also be reduced relative to the Packaged Waste storage option (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further natural resource use would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.	

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities Land Use and Materials	
Proposed Mitigation / Enhancements Measures: • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 has been assessed as having a positive contribution to this objective due to the use of an existing Licensed/Authorised site that will increase the opportunities to make best use of existing infrastructure and resources although this precludes the potential to restore to economic use, previously redundant land. There is little potential for the SDP development to affect the economic potential of adjacent land since activities involving radioactive or nuclear activities will already be taking place. Under RC/RPV storage options construction of the size reduction facility would be delayed and therefore, the volume of natural resources required for development would be reduced relative to the Packaged Waste storage option (which would require construction of all dismantling and size reduction facilities 'up front'). However, further natural resource use would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.	+

Stage II: Designing and Developing the Interim ILW Storage Facilities

Land Use and Materials

Option 1: Develop Greenfield Site for ILW Storage

Assessment of Effects:

Given the generic nature of the construction proposals for the interim storage facility, it assumed that the type of potential effects associated with this objective will be largely similar as for Stage 1 (construction of the dismantling and size reduction facilities).

Under Option 1, all development would take place on greenfield land i.e. land not previously subjected to industrial development such as farmland, parkland, disused quarry or mine works. It is therefore assumed that most or all infrastructure to support the development and operation of a storage facility would be required which would include roads and, depending on the technical option taken forward, docking facilities. Development would therefore alter patterns of land use and a potentially significant volume of greenfield land would be required to accommodate both the storage facility and associated infrastructure. However, the area of undeveloped land required, and therefore the severity of effects on this aspect of the objective, is dependent on the technical option taken forward. There is also potential for development of a greenfield site to lead to the incremental development of land adjacent to the facility due to the creation of new transport infrastructure which may make the location attractive for other business or activities. This could lead to the piecemeal loss of further greenfield land over time however, any such change of land use would need to be consistent with the planning policy requirements set out in the spatial plan of the local planning authority.

Development of a storage facility will result in the use of natural resources, the volume of which is expected to be greater for development on a greenfield site than for Options 2 and 3 given the need to provide supporting infrastructure although dependent on the technical option taken forward. Depending on the location of the site, there is also potential for development to directly lead to the loss of resources for example, through the clearance of woodland, development on agricultural land or use of a disused quarry or mine to accommodate a storage facility. However, it is envisaged that there is an opportunity to ensure that all new buildings and structures use sustainable design and construction practices which may help mitigate any negative effects with respect to the use of natural resources.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well as reception, admin, dispatching, inspection and maintenance areas. Additional infrastructure will also be required under this land use option such as docking facilities, security (standoff and centre), car parking, roads and internal rail line although the total area required for these additional features is unknown.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities, car parking and roads will also be required under this land use option. Should RPVs be transported by sea (which is the most likely option) then docking facilities will also be required.
- Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Additional infrastructure including security (standoff and centre), car parking, roads and an external rail line (if required), will also be required under this land use option. As packaged waste is likely to be transported by either road or rail it is assumed that there will be no need for docking facilities.

Land take for RC storage is expected to be greater than for RPV and Packaged Waste storage options which principally reflects the footprint of the storage facility but also the requirement for construction of docking facilities. Given the volume of greenfield land required to support development under this technical option, it is therefore expected that changes to patterns of land use would be significant. RPV and Packaged Waste storage options are expected to require similar land takes (reflecting the fact that, whilst RPV would require docking facilities, the footprint of the storage facility would be less than for the Packaged Waste option).

Taking into account both the size of facility and type of infrastructure required, RC storage is expected to require the greatest volume of natural resources during construction. However, it is envisaged that the more complex design of the Packaged Waste storage facility would also serve to increase the volume of resources required relative to RPV storage although without detailed designs for each technical option, it has not been possible to determine the magnitude of effects on this aspect of the objective for the different technical options.

Proposed Mitigation / Enhancements Measures:

- Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered

Stage II: Designing and Developing the Interim ILW Storage Facilities **Land Use and Materials**	
to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities a greenfield site).	
Summary: Option 1 has been assessed as having a negative effect in relation to this objective due to the direct loss of greenfield land required for both development of a storage facility and supporting infrastructure which will affect existing uses (whether agricultural or local amenity). The severity of this effect would vary depending upon the type of storage facility constructed. In this respect, it is anticipated that storage of RCs will require construction of a relatively large facility with an area in the region of 11,600m^2 in addition to infrastructure (including docking facilities) compared to RPV and Packaged Waste storage options which require facilities with a floorspace of 801m^2 and 1,004.6m^2 respectively (excluding supporting infrastructure). Given the anticipated increase in the area of greenfield land required to support development of a RC storage facility, implementation of this technical option is expected to increase negative effects associated with land take and changes to patterns of land use. Development of a storage facility could also lead to the incremental loss of adjacent sites, due to the consenting of further piecemeal development over time, making best use of the new transport infrastructure required for the site. Construction of a storage facility will require the use of natural resources. The volume of resources required to support construction on a greenfield site would be greater than for Options 2 and 3 although the significance of the effect on this aspect of the objective is dependent on the detailed design of the storage facility. There may also be an opportunity to adopt sustainable design and construction practices which may alter the volume of resources required under this option.	**-/--**
Option 2: Develop a Brownfield Site for ILW Storage	

Assessment of Effects:

Depending on the previous/existing use of the site taken forward for development, it is envisaged that existing patterns of land use would be altered under this option. This may have a positive effect in relation to this objective as previously developed land would be utilised which is consistent with the objectives of national planning policy and would provide an opportunity to restore land back to viable economic use. Conversely, there is potential for the radioactive waste element of the site's operation to be viewed as undermining the attractiveness of the area which may lead to disinvestment and an increase in vacant land. However, this is highly dependent on how the facilities are perceived.

Given the location of the proposed development of the facility on brownfield land, it is assumed that the loss of undeveloped land/green space under this option would be minimal.

Development of a storage facility will result in the use natural resources although the anticipated scale of the facility is such that the volume of resources required is unlikely to be significant although this is dependent on the technical option taken forward. The option also presents an opportunity to utilise existing infrastructure (e.g. roads), implement sustainable design and construction practices and recycle demolition arisings which may help mitigate any negative effects with respect to the use of natural resources.

As development is to take place on previously developed land, it is not expected that construction would result in the direct loss of natural resources such as woodland or agricultural land.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well as reception, admin, dispatching, inspection and maintenance areas. Security facilities including a security centre and standoff area will also be required as well as an internal rail line. However, it is assumed that docking facilities, car parking and roads will already be present.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and docking facilities (should RPVs be transported by sea) will already be present.
- Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and external rail line (if required) will already be present. As packaged waste is likely to be

Stage II: Designing and Developing the Interim ILW Storage Facilities

Land Use and Materials

transported by either road or rail it is assumed that there will be no need for docking facilities.

Development of a RC storage facility will require a larger area of previously developed land compared to RPV and Packaged Waste technical options which principally reflects the footprint of the vault area necessary to accommodate RCs. Consequently, the potential for changes to existing patterns of land use as a result of the implementation of this option on brownfield land are expected to be greater which could, depending on the previous/existing use of the site, enhance positive effects on this objective by restoring land back to viable economic use.

In view of the scale of facility required for RC storage, it may be expected that this technical option would require the greatest volume of natural resources. However, it is envisaged that the more complex design of the Packaged Waste storage facility would also serve to increase the volume of resources required relative to RPV storage although without detailed designs for each technical option, it has not been possible to determine the magnitude of effects on this aspect of the objective for the different technical options.

Proposed Mitigation / Enhancements Measures:

- Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).

Summary:	
The use of a brownfield site represents a positive contribution to the objective through the reuse of previously redundant (and non economically productive) land, consistent with current national planning policy. Construction of a RC storage facility on brownfield land will require a larger area of previously developed land compared to RPV and Packaged Waste technical options. Depending on the previous/existing use of the site, this technical option is therefore expected to enhance positive effects in relation to this aspect of the objective by restoring a larger area of land back to viable economic use. However, it is recognised that there is the potential that the storage facility development may be viewed negatively which may lead to disinvestment in adjacent land, although this is highly dependent on how the facility is perceived. Conversely, there is potential for the radioactive waste element of the site's operation to be viewed as undermining the attractiveness of the area which may lead to disinvestment and an increase in vacant land. However, this is highly dependent on how the facilities are perceived. Construction of a storage facility on a brownfield site will require some natural resources however, the volume of resources required, whilst unlikely to be significant, is to an extent dependent on the detailed design of the storage facility. There will also be an opportunity to adopt sustainable design and construction practices which may alter the volume of resources required under this option.	**+/-**

Option 3: Develop a Licensed/Authorised Site for ILW Storage

Assessment of Effects:

Option 3 would utilise existing sites Licensed or Approved by the UK nuclear regulators. It is assumed that the area of the site to be used would not be characterised as a redundant brownfield site and that supporting infrastructure would not be required such that the development footprint would not represent a significant change to existing patterns of land use. Furthermore, given that activities involving radioactive or nuclear activities will already be taking place in the adjacent land it is considered unlikely that SDP activities will have any negative effect in relation to land use patterns around the site.

It is assumed that the site would already be developed and the amount of greenfield land and green space required to support development would be minimal.

Development of a storage facility will result in the use natural resources to support construction, the volume of which is dependent on the technical option taken forward. However, this option will make best use of existing infrastructure thereby reducing the volume of natural resources required to support development. It is not expected that construction would result in the direct loss of natural resources such as woodland or agricultural land.

Stage II: Designing and Developing the Interim ILW Storage Facilities Land Use and Materials	
Technical Options: • RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well as reception, admin, dispatching, inspection and maintenance areas. It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present. • RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present. • Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as security (standoff and centre), car parking, external rail line (if required) and roads are assumed to be already present. As the site taken forward for development under this option would be Licensed or Approved by the UK nuclear regulators, it is not envisaged that the implementation of the different technical options above would result in any significant changes to existing patterns of land use. In view of the scale of facility required for RC storage, it may be expected that this technical option would require the greatest volume of natural resources. However, it is envisaged that the more complex design of the Packaged Waste storage facility would also serve to increase the volume of resources required relative to RPV storage although without detailed designs for each technical option, it has not been possible to determine the magnitude of effects on this aspect of the objective for the different technical options. **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).	
Summary: Option 3 has been assessed as having a positive contribution to this objective through the use of an existing Licensed/Authorised site that will increase the opportunities to make best use of existing infrastructure although this precludes the potential to restore to economic use, previously redundant land. Furthermore, there is little potential for the SDP development to negatively affect the economic potential of adjacent land since activities involving radioactive or nuclear activities will already be taking place in the area. Construction of a storage facility on an existing Licensed/Authorised site will require some natural resources however, the volume of resources required, whilst unlikely to be significant, is to an extent dependent on the detailed design of the storage facility. There will also be an opportunity to adopt sustainable design and construction practices which may alter the volume of resources required under this option.	+

Stage III: Docking the Submarines and Processing the Reactor Compartments

Land Use and Materials

Option 1: Dock Submarine & Cut-Out Reactor Compartment

Assessment of Effects:

The majority of effects related to land use and materials are associated with the construction stages of the SDP process (Stages I and II). However, operational activities may have negative effects on the attractiveness of the surrounding area which could indirectly impact upon patterns of land use around SDP sites. These effects are primarily associated with impacts on visual amenity, noise, vibration and dust caused by, for example, the operation of equipment and HGV movements which may undermine the attractiveness of the surrounding area to the existing local community and inward investors. This could result in a reduction in land values and property prices and, potentially, an increase in vacant land should this disturbance be of a significant scale. However, these effects will be predominantly restricted to the areas in and around the dismantling facility and in view of the scale of operational activity proposed under this option, are not expected to be significant. Negative effects are also likely to be reduced further through the adoption of BAT and Environmental Permitting requirements although it is recognised that the severity of these effects may be increased should the dismantling facility be sensitively located. There may be further adverse effects on this aspect of the objective associated with the second phase of operational activity which is considered as part of the assessment of this option under Stage 6.

Whilst radiological doses will be below limits and the risk of accidental discharge is low, it is recognised that this may not be the perception. In this respect, there is potential for the radioactive waste element of the site's operation to be viewed as undermining the attractiveness of the area which may lead to an increase in vacant land in the surrounding area as businesses and residents relocate. Operations may also discourage inward investment, undermining the potential future development of land. However, this is dependent on how operational activities are perceived.

There is a potential risk of accidental discharge of both radiological and non-radiological contaminants during cut-out and buffer storage which could result in the contamination of land in and around the site. Depending on the type and scale of contamination, this could affect neighbouring land uses such as agriculture and/or undermine the developability of land in and around the site as remediation may not be possible/economically viable. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations.

Operational activity will result in the limited use of natural resources such as metals required for additional RC shielding and water for jet blasting although the volume of resources required is not expected to be significant.

Proposed Mitigation / Enhancements Measures:

The proposed mitigation/enhancement measures reflect those associated with other objectives (as many of the identified impacts are also similar).

- Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act
- The use of mains electricity or renewable energy supply in preference to a diesel generator may also help to minimise noise and emissions.
- Limit high noise level generating activities during sensitive periods
- Environmental containment will be provided through a temporary structure with a high efficiency, filtered extract ventilation system.
- Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency.
- Any risk of causing nuisance dust arising from dismantling activities should be reduced by making use of Best Available Technology and selecting suitable energy efficient, low emission equipment.
- In order to alleviate the potential stress on road infrastructure from increased vehicle movements, where practicable, provision should be

Stage III: Docking the Submarines and Processing the Reactor Compartments

Land Use and Materials

made for the transport of operational materials and wastes via rail or sea.

- Adopt HGV routing which seeks to avoid residential areas and existing Air Quality Management Areas.
- Engage the public on a continual basis in order to seek to reduce anxiety relating to radiological discharge. Options for engagement may include regular reporting of discharges via a dedicated website/press releases, creation of a community forum and/or regular attendance by SDP representatives at existing community meetings and development of educational opportunities.
- A waste minimisation strategy should be implemented as part of the Site Waste Management Plan (SWMP). As a minimum, the SWMP should contain detailed measures to comply with relevant waste legislation but should also include good practice guidance and objectives in order to maximise the reduction, reuse and recovery of waste, with disposal to landfill as the least preferred option. The waste minimisation strategy should identify where waste arises in design, procurement and logistics and set out clear mechanisms for achieving waste reduction. Further guidance on site waste management is provided in the Department of Trade and Industry document, Site Waste Management Plans, Guidance for Construction Contractors and Clients and supplementary guidance available from WRAP (www.wrap.org.uk/construction).
- In considering the layout of the dismantling facility, early consideration should be given to the likely location and type of temporary equipment that will be required in order to identify those locations where the introduction of new visual elements could have a negative effect on visual amenity and enable appropriate mitigation measures to be designed and implemented to have maximum impact in terms of reducing any negative effects.
- Temporary equipment which may have a negative effect on visual amenity should be not be retained on-site for longer than is necessary to support operational activities.

Summary:	
Operational activities (e.g. the operation of equipment and HGV movements) associated with RC cut-out could have an adverse effect on the attractiveness of the surrounding area. However, in view of the scale of operational activity associated with RC cut-out, adoption of BAT and the requirements of Environmental Permitting, it is not expected that these effects would be significant. There is potential for concerns relating to the radioactive waste element of the site's operation to undermine the attractiveness of the surrounding area to the local community, existing businesses and inward investors which may lead to an increase in vacant land and disinvestment. However, this is dependent on how operational activities are perceived. Operational activity will result in the limited use of natural resources although the volume of resources required is not expected to be significant.	**0**

Option 2: Dock Submarine & Cut-Out Reactor Pressure Vessel

Assessment of Effects:

It is anticipated that the type and range of effects on land use and materials associated with RPV initial dismantling will be similar to RC initial removal (as identified under Option 1 above). Under this option the extent of operational activities would be intensified such that the level and duration of noise, vibration and emissions caused by the operation of equipment and HGV movements (which would also be required to transport LLW) may also increase relative to Option 1. However, the extent of external submarine hull cutting required under this option would be less and consequently it is considered more likely that noise, vibration and emissions associated with the use of cutting equipment would be reduced. It is also assumed that the number of HGV movements per annum (including those associated with the transportation of LLW) would be minor and their implications in terms of the capacity of the existing transport network would be considered during the design and construction of the dismantling facility (informed by a Transport Assessment and in consultation with the local highways authority) which would mitigate these effects.

The risk of any accidental radiological discharge associated with this option will be exceptionally low but marginally higher than for Option 1 as it requires more intrusive activities (i.e. initial RPV cut-out, handling and LLW segregation) at an earlier stage of the dismantling process. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations.

Stage III: Docking the Submarines and Processing the Reactor Compartments Land Use and Materials	
Proposed Mitigation / Enhancements Measures: • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Operational activities (e.g. the operation of equipment and HGV movements) associated with RPV initial dismantling could have an adverse effect on the attractiveness of the surrounding area. Under this option the extent of operational activities would be intensified such that the level and duration of noise, vibration and emissions caused by the operation of equipment and HGV movements may also increase (relative to Option 1). However, the extent of external submarine hull cutting required under this option would be less than for Option 1 and the number of HGV movements per annum (including those associated with the transportation of LLW) would be minor such that effects are likely to be primarily confined to the site and are unlikely to be significant. There is potential for concerns relating to the radioactive waste element of the site's operation to undermine the attractiveness of surrounding areas to the local community, existing businesses and inward investors which may lead to an increase in vacant land and disinvestment. However, this is dependent on how operational activities are perceived. Operational activity will result in the limited use of natural resources although the volume of resources required for RPV initial dismantling is not expected to be significant.	**0**
Option 3: Dock Submarine & Cut-up Packaged Waste	
Assessment of Effects: The operational effects of Option 3 on land use and materials are expected to be similar to those associated with Option 2 since RPV initial dismantling will also take place under this option. However, they will include additional activities (including size reduction of the RPV and segregation of the resulting LLW and ILW waste streams). It is assumed that full RPV initial dismantling would be undertaken within a dismantling facility and therefore any increases in noise, dust or vibration associated with the on-site works would be confined within the site such that there would not be any further negative effects with respect to the attractiveness of the surrounding area. Full dismantling is expected to generate a higher number of HGV movements in the medium term relative to Options 1 and 2 to transport waste (including LLW), materials and equipment to/from site which could increase disturbance and have an adverse effect on the visual amenity and tranquillity of communities alongside local transport networks. The number of HGV movements per annum would be small such that there is unlikely to be a significant effect on this aspect of the objective. There may also be an opportunity to utilise rail or, given the coastal location, sea which could reduce any negative effects. There is a potential risk of accidental discharge of contaminants during SDP activities, which could result in the contamination of land. Depending on the type and scale of contamination, this could undermine the developability of land in the dockyards as remediation may not be possible/economically viable. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Operational activities (e.g. the operation of equipment and HGV movements) associated with full RC/RPV processing could have an adverse effect on the attractiveness of the surrounding area. Whilst the scale of operational activity required in the medium term under this option is greater than for Options 1 and 2, the severity of effects is expected to be similar as it is assumed that processing would be undertaken inside a dismantling facility building thereby confining emissions, noise and vibration within the site. There is potential for concerns relating to the radioactive waste element of the site's operation to undermine the	**0**

Stage III: Docking the Submarines and Processing the Reactor Compartments Land Use and Materials	
attractiveness of surrounding areas to the local community, existing businesses and inward investors which may lead to an increase in vacant land and disinvestment. However, this is dependent on how operational activities are perceived. Operational activity will result in the limited use of natural resources although the volume of resources required for full RC/RPV processing is not expected to be significant.	

Stage IV: Dismantling and Recycling the Residual Submarine Hulls and Processing Wastes

Land Use and Materials

All Options

Assessment of Effects:

The majority of effects related to land use and materials are associated with the construction stages of the SDP process (Stages 1 and 2). There is potential for preparation activities associated with this stage to have negative effects on the attractiveness of the area surrounding the dismantling facility that could indirectly impact upon patterns of land use. These effects are primarily associated with impacts on visual amenity, noise, vibration and dust caused by the operation of equipment (e.g. hydraulic powered equipment during soft strip) and HGV movements which may undermine the attractiveness of the surrounding area to the existing local community and inward investors. This could result in a reduction in land values and property prices and, potentially, an increase in vacant land should this disturbance be of a significant scale. However, the nature and scale of the works is such that it is anticipated that these effects will be predominantly contained within the dismantling facility and any effects on this aspect of the objective are expected to be minor. Negative effects are also likely to be reduced further through the adoption of BAT and Environmental Permitting requirements although it is recognised that the severity of these effects may be increased should the dismantling facility be sensitively located. Recycling activities will also generate noise, vibration and emissions associated with the use of equipment (e.g. hot cutting) and HGV movements required to transport waste and recyclates from the ship recycling facility which may undermine the attractiveness of surrounding areas. However, as the works would be of a similar nature to those already undertaken on site, it is assumed that there would be no significant change to the existing baseline.

It is assumed that the submarines will have already been drained of the majority of liquids (such as oils, lubricating fluids, coolants and hydraulic fluids) prior to long term storage at the lay-off position. However, there is the possibility that some residual liquids will remain within the submarines the accidental discharge of which could result in the contamination of land in and around the dismantling facility and the ship recycling facility. There is also potential for the discharge of contaminants during shot blasting and removal of equipment and insulation materials. Depending on the type and scale of contamination, this could affect neighbouring land uses such as agriculture and/or undermine the developability of land in and around the sites, as remediation may not be possible/economically viable. However, it is assumed that the work will be subject to stringent health and safety standards, Environmental Permitting regimes and application of BAT for dismantling and it is expected that containment mechanisms will be in place to minimise/confine the effect of such discharges should they occur.

Recycling of the processed submarines will result in the limited use of natural resources such as water in cutting and dust suppression. Indirectly, natural resources will also be consumed in the manufacture of dismantling equipment, protective clothing etc. However, preparation and recycling activities will generate equipment for reuse and recyclates thereby reducing the use of natural resources associated with their manufacture. There is also potential for routine and accidental operational discharges to affect resources such as water and soils although Environmental Permitting requirements and containment mechanisms are expected to control any such effect.

Proposed Mitigation / Enhancements Measures:

- Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act
- The use of mains electricity or renewable energy supply in preference to a diesel generator may also help to minimise noise and emissions.
- Limit high noise level generating activities during sensitive periods
- Environmental containment will be provided through a temporary structure with a high efficiency, filtered extract ventilation system.
- Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency.
- Any risk of causing nuisance dust arising from dismantling activities should be reduced by making use of Best Available Technology and selecting suitable energy efficient, low emission equipment.
- In order to alleviate the potential stress on road infrastructure from increased vehicle movements, where practicable, provision should be made for the transport of operational materials and wastes via rail or sea.

Stage IV: Dismantling and Recycling the Residual Submarine Hulls and Processing Wastes Land Use and Materials	
• Adopt HGV routing which seeks to avoid residential areas and existing AQMAs. • A waste minimisation strategy should be implemented as part of the Site Waste Management Plan (SWMP). As a minimum, the SWMP should contain detailed measures to comply with relevant waste legislation but should also include good practice guidance and objectives in order to maximise the reduction, reuse and recovery of waste, with disposal to landfill as the least preferred option. The waste minimisation strategy should identify where waste arises in design, procurement and logistics and set out clear mechanisms for achieving waste reduction. Further guidance on site waste management is provided in the Department of Trade and Industry document, Site Waste Management Plans, Guidance for Construction Contractors and Clients and supplementary guidance available from WRAP (www.wrap.org.uk/construction). • Temporary equipment which may have a negative effect on visual amenity should be not be retained on-site for longer than is necessary to support operational activities.	
Summary: Submarine preparation and recycling activities could affect the attractiveness of areas surrounding both the dismantling facility and ship recycling facility, as a result of impacts on visual amenity, noise, vibration and dust caused by the operation of plant equipment and HGV movements. However, the nature and scale of the works is such that it is anticipated that these effects will be predominantly contained within the facilities and any effects on this aspect of the objective are expected to be minor. Negative effects are also likely to be reduced further through the adoption of BAT and Environmental Permitting requirements although it is recognised that the severity of these effects may be increased should the dismantling facility be sensitively located. Operational activities will result in the limited use of natural resources although the reuse and recycling of materials and equipment is expected to help offset these effects.	**0**

Stage V: Transporting the RC/RPV/ILW to Interim Storage Land Use and Materials	
Option 1: Reactor Compartment Transport and Storage	
Assessment of Effects: The transportation and subsequent storage of RCs is not expected to require land take or the use of a substantial volume of natural resources such that any direct effects on this objective are unlikely to be significant. Indirect effects are expected to be similar to those associated with RC cut out (Stage 3) and primarily include noise and vibration which could affect existing neighbouring land uses and the developability of surrounding land for some types of development (e.g. residential). The main sources of noise and vibration during this stage of the SDP process would be HGV movements related to the transportation of any wastes, materials or equipment to/from the storage facility, the preparation of RCs for transport (i.e. welding) and loading and unloading as well as any maintenance activities required to preserve structural integrity during interim storage. However, the volume of HGV movements associated with this option are expected to be small and any effects arising from operational activities will be both infrequent (as only a single submarine is to be processed per year) and contained within SDP facilities although it is recognised that their severity may be increased should the dismantling facility or storage facility be sensitively located. Approvals for transportation of RCs will only be given once the regulator is satisfied that the possibility for incidents and accidents has been minimised and that the radiological content can be effectively contained if that were to occur. In this respect, RCs will be sealed prior to movement (in accordance with the Transport Regulations) and made passively safe (i.e. all liquids and potentially mobile radioactive materials would be removed or immobilised) and as such it is not expected that there will be any routine or accidental discharge of radiological contaminants, which could significantly affect both the existing and future use of land both within and in the vicinity of the dismantling and storage facilities. During RC storage, the risk of accidental discharge of radiological contaminants is also considered to be extremely low as the integrity of RCs will be regularly inspected and maintained to ensure that RCs remain passively safe. There remains a theoretical risk of an unplanned incident such as a major fire at the storage facility resulting in the mobilisation and release of radiological contaminants which may land use in the long term. However, for contaminants to be mobilised and released, necessary conditions would have to exist (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. As with dismantling activities (Stages 3 and 6), RC storage may affect how the area in the vicinity of the storage facility is perceived, influencing the future use of land. This could have a negative effect on this objective should storage be viewed negatively and undermine the attractiveness of the area to existing and prospective residents and businesses although this is dependent on how operational activities are perceived. It is not expected that there will be any significant use of natural resources during this stage of the SDP process. **Proposed Mitigation / Enhancements Measures:** • As the type of effects identified in relation to this option are similar to those under Stage 3, the proposed mitigation and enhancement measures are also considered to be same.	
Summary: Transportation and storage of RCs may indirectly affect existing neighbouring land uses and the future developability of surrounding areas due to noise and vibration caused by HGV movements, RC loading/unloading and maintenance activities. However, the volume of HGV movements associated with this option are expected to be very small and any effects arising from operational activities (RC loading/unloading and maintenance) will be both infrequent and contained within SDP facilities although it is recognised that their severity may be increased should the dismantling facility or storage facility be sensitively located. There is potential for concerns relating to the radioactive waste element of the storage facility's operation to undermine the attractiveness of the surrounding area to the local community, existing businesses and inward investors which may lead to an increase in vacant land and disinvestment. However, this is dependent on how operational activities are perceived. It is assumed that containment mechanisms will be in place to prevent the release of contaminants from the storage facility.	**0**

Stage V: Transporting the RC/RPV/ILW to Interim Storage Land Use and Materials	
Option 2: Reactor Pressure Vessel Transport and Storage	
Assessment of Effects: RPV transportation and storage is expected to generate similar effects to those associated with Option 1. There is potential for RPVs to be transported by road which would generate additional noise and vibration, although it is expected that any effects would only be temporary and infrequent (as only a single RPV would transported per year) and, consequently, not significant. RPVs would be sealed and packaged (in accordance with the Transport Regulations) and regularly inspected such that the risk of breach during loading/unloading, transportation and interim storage will be similar to that associated with Option 1. Moreover, it is anticipated that mobile liquids and sludge will have been removed during RPV cut out (Stage 3) and therefore the consequence of a breach on existing and future uses of land and natural resources would be reduced. **Proposed Mitigation / Enhancements Measures:** • As the type of effects identified in relation to this option are similar to those under Stage 3, the proposed mitigation and enhancement measures are also considered to be same.	
Summary: Transportation of RPVs may indirectly affect existing neighbouring land uses and the future developability of surrounding areas due to noise and vibration caused by HGV movements, RPV loading/unloading and maintenance activities. However, the volume of HGV movements associated with this option are expected to be small and any effects arising from operational activities (RPV loading/unloading and maintenance) will be both infrequent and contained within SDP facilities although it is recognised that their severity may be increased should the dismantling facility or storage facility be sensitively located. Under this option there is potential for RPVs to be transported by road which would generate additional noise and vibration although as only a single RPV would transported per year, this transport option is not expected to significantly increase the severity of effects associated with this aspect of the objective. There is potential for concerns relating to the radioactive waste element of the storage facility's operation to undermine the attractiveness of the surrounding area to the local community, existing businesses and inward investors which may lead to an increase in vacant land and disinvestment. However, this is dependent on how operational activities are perceived.	**0**
Option 3: Packaged Waste Transport and Storage	
Assessment of Effects: Packaged waste transportation and storage is expected to generate similar effects to those associated with Options 1 and 2. Packaged waste may be transported by sea, rail or road and should the latter transport option be taken forward (which is the most likely), then it is expected that additional HGV movements would be generated relative to Options 1 and 2. These additional movements (either alone or in combination with other HGV movements required for the transportation of wastes, materials and equipment to/from the dismantling facility and storage facility during this stage) could affect existing neighbouring land uses and the developability of surrounding land for some types of development (e.g. residential) due to emissions of noise and vibration. However, it is expected that the number of HGV movements associated with the transportation of packaged waste would be in the region of 8 per annum and would therefore not present a significant negative effect on this aspect of the objective although it is recognised that the severity of this effect may be increased should the dismantling facility or storage facility be sensitively located. **Proposed Mitigation / Enhancements Measures:** • As the type of effects identified in relation to this option are similar to those under Stage 3, the proposed mitigation and enhancement measures are also considered to be same.	

Stage V: Transporting the RC/RPV/ILW to Interim Storage Land Use and Materials	
Summary: Transportation of packaged waste may indirectly affect existing neighbouring land uses and the future developability of surrounding areas due to noise and vibration caused by HGV movements, packaged waste loading/unloading and any maintenance activities. However, the number of HGV movements associated with this option is expected to be small and any effects arising from operational activities (packaged waste loading/unloading and maintenance) will be both infrequent and contained within SDP facilities although it is recognised that the severity of these effects may be increased should the dismantling facility or storage facility be sensitively located. There is potential for concerns relating to the radioactive waste element of the storage facility's operation to undermine the attractiveness of the surrounding area both to the local community, existing businesses and inward investors which may lead to an increase in vacant land and disinvestment. However, this is dependent on how operational activities are perceived.	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF

Land Use and Materials

Option 1: Reactor Compartment Segregation and Size Reduction, PW Transfer to Proposed GDF

Assessment of Effects:

Operational activities may affect the attractiveness of the surrounding area which could indirectly impact upon patterns of land use around SDP sites. These effects are primarily associated with the removal of RPVs and include impacts on visual amenity, noise, vibration and dust caused by, for example, the operation of equipment such as cranes and cutting equipment. Subsequent size reduction of the RPV and ILW packaging would be undertaken inside a size reduction facility building and, consequently noise, dust or vibration associated with this phase of the works would be confined within the site such that there would not be any further negative effects with respect to the attractiveness of the surrounding area. Negative effects are also likely to be reduced through the adoption of BAT and Environmental Permitting requirements although it is recognised that their severity may be increased should the facility be sensitively located.

There is potential for HGV movements related to the transportation of equipment, waste (including LLW and packaged waste) and materials to undermine the attractiveness of the surrounding area to the existing local community and inward investors due to associated noise, vibration and emissions to air. This could result in a reduction in land values and property prices and, potentially, an increase in vacant land. The severity of these effects is dependent upon the location of the size reduction facility, routing and the proximity of sensitive receptors although it is assumed that the number of HGV movements per annum would be small such that there is unlikely to be a significant effect on this aspect of the objective. There may also be an opportunity to utilise rail or, given the coastal location, sea which could reduce any negative effects.

Recycling activities will also generate noise, vibration and emissions associated with the use of equipment (e.g. hot cutting) and HGV movements required to transport waste and recyclates from the site which may undermine the attractiveness of surrounding areas. However, as the works would be of a similar nature to those already undertaken on site, it is assumed that there would be no significant change to the existing baseline.

As with removal of the RC (Stage 3), there is potential for the radioactive waste element of the site's operation to be viewed as undermining the attractiveness of the area which may lead to an increase in vacant land as businesses and residents relocate. Operations may also discourage inward investment, undermining the potential future development of land. However, this is dependent on how operational activities are perceived.

It is expected that there will be no requirement for transportation of the RC from interim storage to initial dismantling, segregation and size reduction facility as it is considered that these activities will be co located.

There is a potential risk of accidental discharge of contaminants during SDP activities which could result in the contamination of land. Depending on the type and scale of contamination, this could undermine the developability of land as remediation may not be possible/economically viable. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations.

There movement of LLW to the National LLW Repository in Cumbria, packaged waste to the proposed GDF and hazardous waste to management facilities may cause local concern, particularly as a result of an unplanned incident. However, for contaminants to be released, necessary conditions would have to exist for the waste to become mobilised (i.e. sufficient volumes of combustible materials and sufficiently high temperatures) and a pathway present to allow the discharge to reach receptors, the probability of which is considered to be extremely low. Moreover, operational activities will be closely regulated and subject to stringent health and safety standards which is expected to reduce the risk of such accidental discharges. As the RC option also allows for the in-situ decay of short lived ILW, following interim storage, radioactivity levels will have reduced, resulting in a reduction of the total radioactivity that could potentially be discharged to the environment.

Operational activity will result in the limited use of natural resources such as any metals required to make safe the RC hull prior to recycling and water for jet blasting and dust suppression although the volume of resources required is not expected to be significant. Recycling activities will generate recyclates thereby reducing the use of natural resources associated with their manufacture. There is potential for routine and accidental operational discharges to affect resources such as water and soils although Environmental Permitting requirements and containment mechanisms are expected to mitigate this effect.

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Land Use and Materials	
Proposed Mitigation / Enhancements Measures: The proposed mitigation/enhancement measures reflect those associated with other objectives (as many of the identified impacts are also similar). • Noise levels at the nearest receptors would need to be agreed with the Local Authority Environmental Health Officer responsible, and would typically be enforced through a Section 61 Agreement under the Control of Pollution Act • The use of mains electricity or renewable energy supply in preference to a diesel generator may also help to minimise noise and emissions. • Limit high noise level generating activities during sensitive periods • Environmental containment will be provided through a temporary structure with a high efficiency, filtered extract ventilation system. • Measures to reduce the effects of increases in vehicular pollutant emissions and particulate matter should be implemented where possible. This could include: eco-driver training; ensuring all vehicle engines and plant on site are not left running; using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices; keeping plant well maintained and routinely serviced; requiring that all construction vehicles comply with exhaust emission regulations for their class; operating plant away from sensitive receptors (e.g. houses, schools and hospitals); and maximising energy efficiency. • Any risk of causing nuisance dust arising from dismantling activities should be reduced by making use of Best Available Technology and selecting suitable energy efficient, low emission equipment. • In order to alleviate the potential stress on road infrastructure from increased vehicle movements, where practicable, provision should be made for the transport of operational materials and wastes via rail or sea. • Adopt HGV routing which seeks to avoid residential areas and existing Air Quality Management Areas. • Engage the public on a continual basis in order to seek to reduce anxiety relating to radiological discharge. Options for engagement may include regular reporting of discharges via a dedicated website/press releases, creation of a community forum and/or regular attendance by SDP representatives at existing community meetings and development of educational opportunities. • A waste minimisation strategy should be implemented. As a minimum, it should contain detailed measures to comply with relevant waste legislation but should also include good practice guidance and objectives in order to maximise the reduction, reuse and recovery of waste, with disposal to landfill as the least preferred option. • In considering the layout of the dismantling facility, early consideration should be given to the likely location and type of temporary equipment that will be required in order to identify those locations where the introduction of new visual elements could have a negative effect on visual amenity and enable appropriate mitigation measures to be designed and implemented to have maximum impact in terms of reducing any negative effects. • Temporary equipment which may have a negative effect on visual amenity should be not be retained on-site for longer than is necessary to support operational activities.	
Summary: Operational activities associated with this option (particularly RPV removal) could have an adverse effect on the attractiveness of the surrounding area which may indirectly impact upon patterns of land use around SDP sites. However, subsequent size reduction of the RPV and ILW packaging would be undertaken inside a size reduction facility building and, consequently, noise, dust or vibration associated with this phase of the works would be confined within the site such that there would not be any further negative effects with respect to this aspect of the objective. Negative effects are also likely to be reduced further through the adoption of BAT and Environmental Permitting requirements although it is recognised that the severity of these effects may be increased should the size reduction facility be sensitively located. There is potential for concerns relating to the radioactive waste element of the site's operation to undermine the attractiveness of the surrounding area to the local community, existing businesses and inward investors which may lead to an increase in vacant land and disinvestment. However, this is dependent on how operational activities are perceived. Recycling activities will also generate noise, vibration and emissions associated with the use of equipment (e.g. hot cutting) and HGV movements required to transport waste and recyclates from the site which may undermine the attractiveness of	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Land Use and Materials	
surrounding areas. However, as the works would be of a similar nature to those already undertaken on site, it is assumed that there would be no significant change to the existing baseline. Operational activity will result in the use of natural resources although the volume of resources required is not expected to be significant.	
Option 2: Reactor Pressure Vessel Segregation and Size Reduction, PW Transfer to Proposed GDF	
Assessment of Effects: The type and range of effects on land use and materials associated with this option are expected to be similar to those identified under Option 1. However, under Option 2 all operational activity (i.e. RPV processing and ILW packaging) would take place inside a dismantling facility building as works involving RPV removal will have been undertaken during Stage 3. Consequently, it is expected that any associated emissions, noise and vibration would be contained within the site and impacts on visual amenity minimal such that there would not be any significant adverse effects on the attractiveness of the surrounding area. It is also anticipated that, as the volume of waste arisings (both LLW and non-radioactive) would be reduced (as systems and equipment contained within the RC will have already been removed and some size and weight reduction of the RPV would have been undertaken during Stage 3), the number of HGV movements associated with this option would be less than for Option 1. As such, their potential to undermine the attractiveness of the surrounding area to the existing local community and inward investors due to associated noise, vibration and emissions to air is also likely to be reduced (relative to Option 1) although the severity of these effects is dependent upon the location of the facility, HGV routing and the proximity of sensitive receptors. However, there is potential for RPVs to be transported by road or rail from the interim storage facility to the size reduction facility which would require the use of a wide/abnormal load vehicle and security escort generating additional noise and vibration, although it is expected that any effects would only be temporary and infrequent (as only a single RPV would transported per year) and, consequently, are unlikely to be significant. Similar to Option 1, RPVs will be sealed and packaged (in accordance with the Transport Regulations), and consequently it is not expected that there will be any discharge of radiological contaminants during transportation, which could significantly affect both the existing and future use of land both within and in the vicinity of SDP sites. It is also assumed that RPVs would be passively safe (i.e. all liquids and potentially mobile radioactive materials would be removed or immobilised) and as such it is not expected that there will be any risk of accidental discharge of radiological contaminants. The risk of accidental radiological discharge associated with subsequent operational activities (RPV processing and ILW packaging) could be viewed as being less than for Option 1 as RPV removal would not be required having already been undertaken during Stage 3 and the number of LLW movements would also be less. As recycling of submarine hulls will have been undertaken, there would not be any additional effects on land use in the vicinity of the ship recycling facility to those associated with Stage 4. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Under Option 2 it is expected that emissions, noise and vibration associated with RPV dismantling and ILW packaging would be contained within the site and the frequency of HGV movements low such that there would not be any significant adverse effects on the attractiveness of areas surrounding SDP sites (which could indirectly impact upon patterns of land use around SDP sites). Notwithstanding this, there is potential for concerns relating to the radioactive waste element of the size reduction facility's operation to undermine the attractiveness of the surrounding area to the local community, existing businesses and inward investors which may lead to an increase in vacant land and disinvestment. However, this is dependent on how operational activities are perceived. Operational activity will result in the use of natural resources although the volume of resources required is not expected to be significant.	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Land Use and Materials	
Option 3: Transport Packaged Waste to Proposed GDF	
Assessment of Effects: Under Option 3 all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process) and consequently, effects on this objective will relate to the transportation of packaged waste to the proposed GDF only. These effects are expected to be similar to those associated with the transportation of packaged waste identified under Options 1 and 2. There is the potential for packaged waste to be transported at a higher frequency than 8 separate movements per annum (subject to the number of over packs available and proposed GDF availability to receive packaged waste) as under this option no further processing prior to transportation to the proposed GDF would be required. As a high end estimate, if all packaged waste was to be moved over a period of 1 year with the existing number of overpacks (2), transport movements would occur approximately 4 times per week. However, taking into account the fact that there would be no (or very few) standard HGV movements associated with this option and that any adverse effects would only be temporary (within the context of a project lasting decades), it is not expected that this frequency of movement would significantly undermine the attractiveness of the surrounding area to the existing local community and inward investors (and therefore affect land values, property prices and the volume of vacant land). However, it is recognised that the severity of any adverse effects is dependent on a number of factors including whether packaged waste is transported by road or rail, the timing and routing of movements and the proximity of sensitive receptors. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Under Option 3 all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process). It is assumed that packaged waste would be transported by road requiring the use of a wide/abnormal load vehicle and security escort, generating noise and vibration which could indirectly affect existing neighbouring land uses and the future developability of surrounding areas due to emissions of noise and vibration. However, the frequency of movements is such that any effects on this aspect of the objective are expected to be minor. There may also be an opportunity to transport packaged waste by sea or rail which could reduce any negative effects. Accidental discharges of radiological contaminants could significantly affect the availability of natural resources. However, ILW would be packaged prior to transportation and under this option liquids and sludges will have been removed reducing the risk of any contamination should a breach occur such that the residual risk is considered to be extremely low.	**0**

Stage VII: Decommissioning the SDP Facilities Land Use and Materials	
Option 1: Decommission Greenfield Sites	
Assessment of Effects: Decommissioning and restoration activities would remove all buildings and supporting infrastructure and contaminated land would be subject to remediation. This would serve to improve and restore land use patterns to that observed prior to development and recreate green space lost as a result of the development of SDP facilities. However, restoration to background may undermine the potential to make best use of the facilities for example, there may be opportunities as part of any facility review to refit the facilities for the dismantling of further submarines (although this is currently outside the scope of this assessment). Decommissioning activities will involve the demolition, excavation, movement and treatment of radiologically contaminated material, particularly arising from the size reduction facility (e.g. the hot cell). Most radiologically contaminated materials are expected to be solid, comprising a selection of concrete and cut up apparatus such as pipes and cladding although there is some potential that small amounts of liquids (crud and sludge) from the effluent treatment plant will be present, the discharge of which could significantly impact upon neighbouring land uses such as such as agriculture and/or undermine the developability of land in and around SDP sites. However, it is assumed that all activities will be subject to BAT and ALARP and that containment mechanisms would be in place to prevent discharge to the environment. There is a potential risk of accidental discharge of radiation during decommissioning although the probability of any such discharges having a significant impact on land use will be low given that decommissioning activities will be closely regulated and subject to stringent Health and Safety and Environmental Permitting requirements. These requirements will ensure that any discharges to the environment are both minimised, and within the limits defined in the site permit. The construction of any temporary structures required to support decommissioning as well as the packaging of any resulting ILW and LLW will result in the consumption of natural resources and material assets (e.g. concrete and steel). It is also expected that some ex-situ remediation will be required involving the replacement of soils to backfill voids left by excavated contaminants which may be freshly quarried material or replacement soil. However, the volume of resources required is unlikely to be significant and the management of waste would ensure the effective application of the Waste Hierarchy. There is potential for routine and accidental discharges (both radiological and non-radiological) to affect resources such as water and soils although Environmental Permitting requirements and containment mechanisms are expected to mitigate this effect. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. Land take associated with the development of a RC interim storage facility is expected to be greater than for RPV and Packaged Waste storage options which principally reflects the footprint of the storage facility but also the requirement for construction of docking facilities. Consequently, decommissioning activities associated with this technical option may require a greater volume of soils to backfill any voids although this is not expected to significantly affect the severity of effects associated with decommissioning activities on this objective **Proposed Mitigation / Enhancements Measures:** • Seek to limit noise, dust and mobilisation of any contaminants during demolition as part of a Demolition Environmental Management Plan (DEMP).	
Summary: Decommissioning and site restoration would remove all buildings, supporting infrastructure and contaminants, returning SDP sites to a greenfield end state. This would serve to improve and re-establish land use patterns to that observed prior to development and consequently Option 1 is considered to have a long term significantly positive effect in relation to this aspect of	**-/++**

Stage VII: Decommissioning the SDP Facilities Land Use and Materials	
the objective. Construction of temporary supporting facilities, packaging of ILW and LLW and backfill will result in the consumption of natural resources and material assets which could have a negative effect in the short to medium term. However, the volume of resources required is unlikely to be significant and it is expected that a large proportion of waste (particularly non-radioactive and hazardous materials) would be reused or recycled.	
Option 2: Decommission Brownfield Sites	
Assessment of Effects: Effects on land use and materials related to decommissioning activities are expected to be similar to those identified for Option 1 above. Under this option it is assumed that SDP sites would be returned to brownfield and be suitable for release to other uses. This would serve to enhance the potential of the sites to accommodate a greater range of land uses although it is not expected that this would differ significantly from the site's state prior to development which would effectively be re-established. This option may enable the continued use of any new infrastructure and buildings constructed during Stages 1 and 2 of the SDP process (as well as pre-existing infrastructure) which would have a positive effect in relation to making the best use of existing infrastructure and resources. However, this is dependent on the decommissioning strategy implemented and the requirements of future occupiers. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. Land take associated with the development of a RC interim storage facility is expected to be greater than for RPV and Packaged Waste storage options which principally reflects the footprint of the storage facility. Consequently, decommissioning activities associated with this technical option may require a greater volume of soils to backfill any voids although this is not expected to significantly affect the severity of effects associated with decommissioning activities on this objective **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1. **Assumptions and Uncertainties:** • Assumptions and uncertainties are considered to be the same as for Option 1.	
Summary: Decommissioning and site restoration would serve to re-establish the site to brownfield land use patterns which are not considered to differ considerably to during development and, consequently, this option is considered to have a neutral effect in relation to this aspect of the objective. Depending on the decommissioning strategy implemented as well as the requirements of future occupiers, this option may enable the continued use of new infrastructure and buildings constructed during Stages 1 and 2 of the SDP process thereby helping to maximise the use of existing infrastructure and resources.	**0**

Stage VII: Decommissioning the SDP Facilities **Land Use and Materials**	
Construction of temporary supporting facilities, packaging of ILW and LLW and backfill will result in the consumption of natural resources and material assets. However, the volume of resources required is unlikely to be significant and it is expected that a large proportion of waste (particularly non-radioactive and hazardous materials) would be reused or recycled.	
Option 3: Decommission Licensed/Authorised Sites	
Assessment of Effects: Effects on land use and materials related to decommissioning activities are expected to be similar to those detailed under Options 1 and 2. Following decommissioning, SDP sites would continue to be Licensed/Authorised such that there would be no significant change to existing patterns of land use. It is assumed that there would be potential to retain some of the new ancillary facilities and any additional infrastructure constructed during Stages 1 and 2 (as well as some pre-existing infrastructure/facilities) which may support the continued operation of the wider site and/or redevelopment. However, this is dependent on the decommissioning strategy implemented and the specific requirements of any future uses. **Technical Options:** As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence of the technical options on their severity is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** • None identified. **Assumptions and Uncertainties:** • As the options assessed are not site specific, it is not possible to determine with certainty what the impact would be with respect to existing or proposed redevelopment/regeneration programmes.	
Summary: Under Option 3, SDP sites would continue to be Licensed/Authorised following decommissioning and, consequently, it is expected that this option would have a neutral effect in relation to patterns of land use. This option presents the greatest opportunity to ensure the continued use of infrastructure and facilities although this is dependent on the decommissioning strategy implemented and the specific requirements of any future uses. Construction of temporary supporting facilities, packaging of ILW and backfill will result in the consumption of natural resources and material assets. However, the volume of resources required is unlikely to be significant and it is expected that a large proportion of waste (particularly non-radioactive and hazardous materials) would be reused or recycled.	**0**

12.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the land use and materials objective. **Box 12.2** provides a summary of the options that have been assessed.

Box 12.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 12.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	-/+	-/+	-/+	**<u>Potential Effects</u>** In the case of these options, SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards, with no additional land take required. These options would therefore avoid any loss of undeveloped land or green spaces. Radiological dose to workers would be significantly below statutory limits and there would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. However, it is recognised that this may not be the perception. In this respect, there is potential for SDP activities to have a negative effect in relation to neighbouring land use patterns around the Devonport and Rosyth dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*. On the one hand, as the interim storage facility is to be located within an existing nuclear licensed site this may be viewed as a continuation of existing use and consequently may not affect local perceptions and land use patterns. On the other hand, there is the potential for ILW storage at the Devonport and Rosyth dockyards to be viewed as undermining the attractiveness of the area which may lead to an increase in vacant land as businesses and residents relocate. Operations may also discourage inward investment, undermining the potential future development of land. However, this is dependant on how SDP activities are perceived. There is a potential risk of accidental discharge of contaminants during SDP activities (refer to E. Geology and Soils), which could result in the contamination of land in the Devonport and Rosyth dockyards. Depending on the type and scale of contamination, this could undermine the developability of land in the dockyards as remediation may not be possible/economically viable. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations. The Devonport and Rosyth dockyards are well established dockyards, with existing facilities and infrastructure in place that are broadly compatible with SDP facility requirements, although some modification to existing facilities and new build would be required. Where possible, existing facilities and infrastructure would be utilised at both dockyards, which would contribute positively towards sustainable land use. Modifications to existing facilities and the construction of new SDP facilities at the Devonport and Rosyth dockyards would require the use of natural resources, with the potential for impacts through the supply chain on limited or sensitive natural resources such as minerals, metals and timber products. However, taking account of existing facility provision and the scale of development required, resource requirements are not anticipated to be significant. There is likely to be opportunities to utilise existing infrastructure and resources, and to promote sustainable design and construction practices.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets. *(continued)*	-/+	-/+	-/+	SDP activities would require use of natural resources such as metals for additional RC shielding and water for dust suppression, jet blasting and cutting. Indirectly, natural resources would also be consumed in the manufacture of equipment, protective clothing etc. However, preparation and recycling activities will generate equipment for reuse and recyclates thereby reducing the use of natural resources associated with their manufacture. Of the technical options, the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2, and therefore land-take within the dockyards could be greater for the RC option. Taking account of scale, resource use during construction could also be greater for the RC option. However, this is dependant on facility design and build requirements, which have not been confirmed at this stage. <u>Devonport Dockyard</u> Devonport dockyard predominantly comprises buildings, dockyard infrastructure and

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				hardstanding, dry docks and basins. The dockyard is primarily made of reclaimed ground, with localised contamination (refer to E. Geology and Soils). It is assumed that SDP facilities and infrastructure would be located within the nuclear licensed site at the dockyard, with no additional land take required. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Plymouth City Council has identified a number of regeneration areas within Plymouth in their Core Strategy, which includes Devonport to the east of Devonport dockyard. Devonport is part of the City Centre & Waterfront Regeneration Area. Proposals for Devonport are set out in an Area Action Plan, which includes the development of a new centre, improving housing, and providing a better range of local services & facilities. Weston Mill, to the north-west of Devonport dockyard, is also identified in the Core Strategy as an area of regeneration. This area is being developed as a New District Centre, to rectify deficiencies in community facility provision. As noted previously, whilst there would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event, it is recognised that this may not be the perception. In consequence, there is the potential for SDP activities at Devonport dockyard to have a negative effect on neighbouring land uses, including the regeneration of Devonport and Weston Mill, depending on how the storage of radioactive waste at Devonport dockyard is perceived. Rosyth Dockyard Devonport dockyard predominantly comprises buildings, dockyard infrastructure and hardstanding, dry docks and basins. It is understood that part of Rosyth dockyard is reclaimed land, which due to the nature of infill material used may be contaminated (refer to E. Geology and Soils). It is assumed that SDP facilities and infrastructure would be located within the nuclear licensed site at the dockyard, with no additional land take required. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. The Draft Dunfermline & West Fife Local Plan includes a Settlement Planfor Rosyth, which promotes the development of Rosyth waterfront as a European Gateway and business park. Land to the east of Rosyth dockyard has been allocated for employment, community and leisure development. Land for a port container terminal has also been allocated to the west of Rosyth dockyard, and several sites around the town of Rosyth have been allocated for housing, including on Admiralty Road to the north of Rosyth dockyard.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets. *(continued)*	-/+	-/+	-/+	There is the potential for SDP activities at Rosyth dockyard to have a negative effect on neighbouring land uses, including the regeneration of Rosyth and development of the waterfront, depending on how the storage of radioactive waste at Rosyth dockyard is perceived. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards require comparable facilities for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Depending on facility design and build requirements, Option 1D could therefore potentially result in greater resource use, although no significant impacts on natural resources from construction are anticipated. There is not expected to be any difference in land take between the two dockyards, assuming that SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards, with no additional land take required. At both Devonport and Rosyth dockyard there is the potential for the SDP to affect neighbouring land use patterns and regeneration initiatives, depending on how interim storage of radioactive waste at the dockyards is perceived.

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites could affect neighbouring land use and regeneration initiatives at both dockyards. Overall, scale of potential effect of Option 1B could be greater than that of Options 1D and 1R as SDP facilities would need to be constructed at both dockyards, requiring greater natural resource use and potentially resulting in greater impacts on land use.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score 2D	Score 2R	Score 2B	Commentary
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	-/+	-/+	-/+	**Potential Effects** In the case of these options, SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards, with no additional land take required. These options would therefore avoid any loss of undeveloped land or green spaces. Radiological dose to workers would be significantly below statutory limits and there would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. However, it is recognised that this may not be the perception. In this respect, there is potential for SDP activities to have a negative effect in relation to neighbouring land use patterns around the Devonport and Rosyth dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*. On the one hand, as the interim storage facility is to be located within an existing nuclear licensed site this may be viewed as a continuation of existing use and consequently may not affect local perceptions and land use patterns. On the other hand, there is the potential for ILW storage at the Devonport and Rosyth dockyards to be viewed as undermining the attractiveness of the area which may lead to an increase in vacant land as businesses and residents relocate. Operations may also discourage inward investment, undermining the potential future development of land. However, this is dependant on how SDP activities are perceived. There is a potential risk of accidental discharge of contaminants during SDP activities (refer to E. Geology and Soils), which could result in the contamination of land in the Devonport and Rosyth dockyards. Depending on the type and scale of contamination, this could undermine the developability of land in the dockyards as remediation may not be possible/economically viable. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets. *(continued)*	-/+	-/+	-/+	The Devonport and Rosyth dockyards are well established dockyards, with existing facilities and infrastructure in place that are broadly compatible with SDP facility requirements, although some modification to existing facilities and new build would be required. Where possible, existing facilities and infrastructure would be utilised at both dockyards, which would contribute positively towards sustainable land use. Modifications to existing facilities and the construction of new SDP facilities at the Devonport and Rosyth dockyards would require the use of natural resources, with the potential for impacts through the supply chain on limited or sensitive natural resources such as minerals, metals and timber products. However, taking account of existing facility provision and the scale of development required, resource requirements are not anticipated to be significant. There is likely to be opportunities to utilise existing infrastructure and resources, and to promote sustainable design and construction practices. SDP activities would require use of natural resources such as metals for additional RC shielding and water for dust suppression, jet blasting and cutting. Indirectly, natural resources would also be consumed in the manufacture of equipment, protective clothing etc. However, preparation and recycling activities will generate equipment for reuse and recyclates thereby reducing the use of natural resources associated with their manufacture. There is the potential for accidental discharges (both radiological and non-radiological) to affect resources such as water and soils, although Environmental Permitting requirements and containment mechanisms are expected to minmise the likelihood and consequences of this effect. Of the technical options, the scale of development required for the RPV option would be less than the other options, with the RPV option requiring a new interim storage area with a footprint of $801m^2$, and therefore land-take within the dockyards would be less for the RPV option. Taking account of scale, resource use during construction could also be greater for

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				the RPV option. However, this is dependant on facility design and build requirements, which have not been confirmed at this stage.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets. *(continued)*	-/+	-/+	-/+	<u>Devonport Dockyard</u> Devonport dockyard predominantly comprises buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is primarily made of reclaimed ground, with localised contamination (refer to E. Geology and Soils). It is assumed that SDP facilities and infrastructure would be located within the nuclear licensed site at the dockyard, with no additional land take required. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Plymouth City Council has identified a number of regeneration areas within Plymouth in their Core Strategy, which includes Devonport to the east of Devonport dockyard. Devonport is part of the City Centre & Waterfront Regeneration Area. Proposals for Devonport are set out in an Area Action Plan, which includes the development of a new centre, improving housing, and providing a better range of local services & facilities. Weston Mill, to the north-west of Devonport dockyard, is also identified in the Core Strategy as an area of regeneration. This area is being developed as a New District Centre, to rectify deficiencies in community facility provision. There is the potential for SDP activities at Devonport dockyard to have a negative effect on neighbouring land uses, including the regeneration of Devonport and Weston Mill, depending on how the storage of radioactive waste at Devonport dockyard is perceived. <u>Rosyth Dockyard</u> Devonport dockyard predominantly comprises buildings, dockyard infrastructure and hardstanding, dry docks and basins. It is understood that part of Rosyth dockyard is reclaimed land, which due to the nature of infill material used may be contaminated (refer to E. Geology and Soils). It is assumed that SDP facilities and infrastructure would be located within the nuclear licensed site at the dockyard, with no additional land take required. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. The Draft Dunfermline & West Fife Local Plan includes a Settlement Planfor Rosyth, which promotes the development of Rosyth waterfront as a European Gateway and business park. Land to the east of Rosyth dockyard has been allocated for employment, community and leisure development. Land for a port container terminal has also been allocated to the west of Rosyth dockyard, and several sites around the town of Rosyth have been allocated for housing, including on Admiralty Road to the north of Rosyth dockyard. There is the potential for SDP activities at Rosyth dockyard to have a negative effect on neighbouring land uses, including the regeneration of Rosyth and development of the waterfront, depending on how the storage of radioactive waste at Rosyth dockyard is perceived. **<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards require comparable facilities for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Depending on facility design and build requirements, Option 2D could therefore potentially result in greater resource use, although no significant impacts on natural resources from construction are anticipated.

Assessment Criteria	**Score**			**Commentary**
	2D	**2R**	**2B**	
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets. *(continued)*	-/+	-/+	-/+	There is not expected to be any differences in land take between the two dockyards, assuming that SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards, with no additional land take required. At both Devonport and Rosyth dockyard there is the potential for the SDP to affect neighbouring land use patterns and regeneration initiatives, depending on how interim storage of radioactive waste at the dockyards is perceived. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites could affect neighbouring land use and regeneration initiatives at both dockyards. Overall, the scale of potential effect of Option 2B could be greater than that of Options 2D and 2R as SDP facilities would need to be constructed at both dockyards, requiring greater natural resource use and potentially resulting in greater impacts on land use.

Option 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	- /+/?	- /+/?	- /+/?	**<u>Potential Effects</u>** Dismantling facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards, with no additional land take required. Undertaking dismantling activities at the Devonport and Rosyth dockyards would therefore avoid any loss of undeveloped land or green spaces. Radiological dose to workers would be significantly below statutory limits and there would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. However, it is recognised that this may not be the perception. In this respect, there is potential for SDP activities to have a negative effect in relation to neighbouring land use patterns around the Devonport and Rosyth dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*. In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation/size reduction (full dismantling of the RPV following interim storage). Depending on the location of the remote site there is the potential for interim storage and subsequent segregation/size reduction activities to have a negative effect in relation to neighbouring land use patterns, depending on how the storage of radioactive waste at the remote site is perceived. There is the potential for interim storage at a remote site to be viewed as undermining the attractiveness of the area which may lead to an increase in vacant land as businesses and residents relocate. Operations may also discourage inward investment, undermining the potential future development of land. Although this will depend on the location of the remote site and how the activities are perceived. There is a potential risk of accidental discharge of contaminants during SDP activities (refer to E. Geology and Soils), which could result in the contamination of land in the Devonport and Rosyth dockyards. Depending on the type and scale of contamination, this could undermine the developability of land in the dockyards as remediation may not be possible/economically viable. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	- /+/?	- /+/?	- /+/?	There is a potential risk of accidental discharge of both radiological and non-radiological contaminants during SDP activities (refer to E. Geology and Soils), which could result in the contamination of land in the Devonport and Rosyth dockyards. Depending on the type and scale of contamination, this could undermine the developability of land in the dockyards as remediation may not be possible/economically viable. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations. The Devonport and Rosyth dockyards are well established dockyards, with existing facilities and infrastructure in place that are broadly compatible with dismantling requirements, although some modification to existing facilities and new build would be required. Where possible, existing facilities and infrastructure would be utilised at both dockyards, which would contribute positively towards sustainable land use. Modifications to existing facilities and the construction of new SDP facilities would require

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				the use of natural resources, with the potential for impacts through the supply chain on limited or sensitive natural resources such as minerals, metals and timber products. However, for initial dismantling taking account of existing facility provision and the scale of development required at the Devonport and Rosyth dockyards, resource requirements are not anticipated to be significant. There is likely to be opportunities to utilise existing infrastructure and resources, and to promote sustainable design and construction practices. SDP activities would require use of natural resources such as metals for additional RC shielding and water for dust suppression, jet blasting and cutting. Indirectly, natural resources would also be consumed in the manufacture of equipment, protective clothin etc. However, preparation and recycling activities will generate equipment for reuse and recyclates thereby reducing the use of natural resources associated with their manufacture. There is the potential for accidental discharges (both radiological and non-radiological) to affect resources such as water and soils, although Environmental Permitting requirements and containment mechanisms are expected to minmise the likelihood and consequences of this effect. As a remote site for interim storage has not been identified at this stage it is unknown whether interim storage and subsequent segregation/size reduction activities would affect land use. Similarly, it is unknown whether there would be opportunity to utilise existing facilities and infrastructure for interim storage and segregation/size reduction activities.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	- /+/?	- /+/?	- /+/?	Of the technical options, the scale of development required for the RPV option would be less than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2, and therefore land-take within the dockyards would be less for the RPV option. Taking account of scale, resource use during construction could also be greater for the RPV option. However, this is dependant on facility design and build requirements, which have not been confirmed at this stage. <u>Devonport Dockyard</u> Devonport dockyard predominantly comprises buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is primarily made of reclaimed ground, with localised contamination (refer to E. Geology and Soils). It is assumed that SDP facilities and infrastructure would be located within the nuclear licensed site at the dockyard, with no additional land take required. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Plymouth City Council has identified a number of regeneration areas within Plymouth in their Core Strategy, which includes Devonport to the east of Devonport dockyard. Devonport is part of the City Centre & Waterfront Regeneration Area. Proposals for Devonport are set out in an Area Action Plan, which includes the development of a new centre, improving housing, and providing a better range of local services & facilities. Weston Mill, to the north-west of Devonport dockyard, is also identified in the Core Strategy as an area of regeneration. This area is being developed as a New District Centre, to rectify deficiencies in community facility provision. There is the potential for SDP activities at Devonport dockyard to have a negative effect on neighbouring land uses, including the regeneration of Devonport and Weston Mill, depending on how they are perceived. <u>Rosyth Dockyard</u> Devonport dockyard predominantly comprises buildings, dockyard infrastructure and hardstanding, dry docks and basins. It is understood that part of Rosyth dockyard is reclaimed land, which due to the nature of infill material used may be contaminated (refer to

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				E. Geology and Soils). It is assumed that SDP facilities and infrastructure would be located within the nuclear licensed site at the dockyard, with no additional land take required. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. The Draft Dunfermline & West Fife Local Plan includes a Settlement Planfor Rosyth, which promotes the development of Rosyth waterfront as a European Gateway and business park. Land to the east of Rosyth dockyard has been allocated for employment, community and leisure development. Land for a port container terminal has also been allocated to the west of Rosyth dockyard, and several sites around the town of Rosyth have been allocated for housing, including on Admiralty Road to the north of Rosyth dockyard. There is the potential for SDP activities at Rosyth dockyard to have a negative effect on neighbouring land uses, including the regeneration of Rosyth and development of the waterfront, depending on how they are perceived.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	-/+/?	-/+/?	-/+/?	**<u>Comparison of the Options</u>** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. There is not expected to be any difference in land take between the two dockyards, assuming that dismantling facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards, with no additional land take required. At both Devonport and Rosyth dockyard there is the potential for initial dismantling activities to affect neighbouring land use patterns and regeneration initiatives, depending on how dismantling activities at the dockyards is perceived. At this stage a remote site for interim storage has not been identified and subsequently the potential impact of interim storage and segregation/size reduction activities on land use and materials is uncertain at this stage. The potential for effects would depend on the location and land use of the remote site, the scale of development required and the existing facilities and infrastructure in place. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites could affect neighbouring land use and regeneration initiatives at both dockyards. Overall, the scale of potential effect of Option 3/4B could be greater than that of Options 3/4D and 3/4R as SDP facilities would need to be constructed at both dockyards, requiring greater natural resource use and potentially resulting in greater impacts on land use.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	-/+	-/+	-/+	**Potential Effects** SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards, with no additional land take required. These options would therefore avoid any loss of undeveloped land or green spaces. Radiological dose to workers would be significantly below statutory limits and there would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. However, it is recognised that this may not be the perception. In this respect, there is potential for SDP activities to have a negative effect in relation to neighbouring land use patterns around the Devonport and Rosyth dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*. Dismantling activities are not anticipated to affect neighbouring land use, as the Devonport and Rosyth dockyards are operational dockyards and nuclear licensed sites, and the dismantling activities would be of a similar nature to existing activities taking place and consistent with the character of the existing dockyards. However, there is the potential for effects in the long term, depending on how the storage of radioactive waste at the Devonport and Rosyth dockyards is perceived. On the one hand, as the interim storage facility is to be located within an existing nuclear licensed site this may be viewed as a continuation of existing use and consequently may not affect local perceptions and land use patterns.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets. *(continued)*	-/+	-/+	-/+	On the other hand, there is the potential for ILW storage at the Devonport and Rosyth dockyards to be viewed as undermining the attractiveness of the area which may lead to an increase in vacant land as businesses and residents relocate. Operations may also discourage inward investment, undermining the potential future development of land. However, this is dependant on how SDP activities are perceived. There is a potential risk of accidental discharge of both radiological and non-radiological contaminants during SDP activities (refer to E. Geology and Soils), which could result in the contamination of land in the Devonport and Rosyth dockyards. Depending on the type and scale of contamination, this could undermine the developability of land in the dockyards as remediation may not be possible/economically viable. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations. The Devonport and Rosyth dockyards are well established dockyards, with existing facilities and infrastructure in place that are broadly compatible with SDP facility requirements, although some modification to existing facilities and new build would be required. Where possible, existing facilities and infrastructure would be utilised at both dockyards, which would contribute positively towards sustainable land use. Modifications to existing facilities and the construction of new SDP facilities at the Devonport and Rosyth dockyards would require the use of natural resources, with the potential for impacts through the supply chain on limited or sensitive natural resources such as minerals, metals and timber products. However, taking account of existing facility provision and the scale of development required, resource requirements are not anticipated to be significant. There is likely to be opportunities to utilise existing infrastructure and resources, and to promote sustainable design and construction practices. SDP activities would require use of natural resources such as metals for additional RC shielding and water for dust suppression, jet blasting and cutting. Indirectly, natural resources would also be consumed in the manufacture of equipment, protective clothing etc. However, preparation and recycling activities will generate equipment for reuse and

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				recyclates thereby reducing the use of natural resources associated with their manufacture. There is the potential for routine and accidental discharges (both radiological and non-radiological) to affect resources such as water and soils, although Environmental Permitting requirements and containment mechanisms are expected to minmise the likelihood and consequences of this effect. Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. The potential impact on land use during construction for the PW option could therefore be greater than the RPV option but less than the RC option. Taking account of scale, resource use during construction could also be greater for the RPV option. However, this is dependant on facility design and build requirements, which have not been confirmed at this stage.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets. *(continued)*	-/+	-/+	-/+	Devonport Dockyard Devonport dockyard predominantly comprises buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is primarily made of reclaimed ground, with localised contamination (refer to E. Geology and Soils). It is assumed that SDP facilities and infrastructure would be located within the nuclear licensed site at the dockyard, with no additional land take required. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Plymouth City Council has identified a number of regeneration areas within Plymouth in their Core Strategy, which includes Devonport to the east of Devonport dockyard. Devonport is part of the City Centre & Waterfront Regeneration Area. Proposals for Devonport are set out in an Area Action Plan, which includes the development of a new centre, improving housing, and providing a better range of local services & facilities. Weston Mill, to the north-west of Devonport dockyard, is also identified in the Core Strategy as an area of regeneration. This area is being developed as a New District Centre, to rectify deficiencies in community facility provision. There is the potential for SDP activities at Devonport dockyard to have a negative effect on neighbouring land uses, including the regeneration of Devonport and Weston Mill, depending on how the storage of radioactive waste at Devonport dockyard is perceived. Rosyth Dockyard Devonport dockyard predominantly comprises buildings, dockyard infrastructure and hardstanding, dry docks and basins. It is understood that part of Rosyth dockyard is reclaimed land, which due to the nature of infill material used may be contaminated (refer to E. Geology and Soils). It is assumed that SDP facilities and infrastructure would be located within the nuclear licensed site at the dockyard, with no additional land take required. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. The Draft Dunfermline & West Fife Local Plan includes a Settlement Planfor Rosyth, which promotes the development of Rosyth waterfront as a European Gateway and business park. Land to the east of Rosyth dockyard has been allocated for employment, community and leisure development. Land for a port container terminal has also been allocated to the west of Rosyth dockyard, and several sites around the town of Rosyth have been allocated for housing, including on Admiralty Road to the north of Rosyth dockyard. There is the potential for SDP activities at Rosyth dockyard to have a negative effect on neighbouring land uses, including the regeneration of Rosyth and development of the waterfront, depending on how the storage of radioactive waste at Rosyth dockyard is perceived.

Assessment Criteria	Score			Commentary
	5D	5R	5B	
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets. *(continued)*	-/+	-/+	-/+	**<u>Comparison of the Options</u>** Assuming that the Devonport and Rosyth dockyards require comparable facilities for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Depending on facility design and build requirements, Option 5D could therefore potentially result in greater resource use, although no significant impacts on natural resources from construction are anticipated. There is not expected to be any difference in land take between the two dockyards, assuming that SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards, with no additional land take required. At both Devonport and Rosyth dockyard there is the potential for the SDP to affect neighbouring land use patterns and regeneration initiatives, depending on how interim storage of radioactive waste at the dockyards is perceived. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites could affect neighbouring land use and regeneration initiatives at both dockyards. In the case of this combination option as SDP facilities would not be provided at both sites this option would not result in additional resource use and land take from construction of SDP facilities when compared to those combination options proposing the use of both dockyards for dismantling and interim storage.

Options 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	-/+/?	-/+/?	-/+/?	**Potential Effects** SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards, with no additional land take required. Undertaking dismantling and segregation/size reduction activities at the Devonport and Rosyth dockyards would therefore avoid any loss of undeveloped land or green spaces. Radiological dose to workers would be significantly below statutory limits and there would be no discernable effect on the public from any radiological discharges from either planned dismantling activities, or from an unplanned event (e.g. an accident), as the SDP will have to achieve compliance with Statutory 'ALARP' principles and be inherently safe before any work could begin. However, it is recognised that this may not be the perception. In this respect, there is potential for SDP activities to have a negative effect in relation to neighbouring land use patterns around the Devonport and Rosyth dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*. Dismantling and segregation/size reduction activities are not anticipated to affect neighbouring land use, as the Devonport and Rosyth dockyards are operational dockyards and nuclear licensed sites, and the dismantling activities would be of a similar nature to existing activities taking place and consistent with the character of the existing dockyards *(refer to impacts specific to the Devonport and Rosyth dockyards)*. Following full dismantling of the RPVs, the resulting PW would be transported off the site to a remote site for interim storage. Depending on the location of the remote site there is the potential for interim storage to have a negative effect in relation to neighbouring land use patterns, depending on how the storage of radioactive waste at the remote site is perceived. There is the potential for interim storage at a remote site to be viewed as undermining the attractiveness of the area which may lead to an increase in vacant land as businesses and residents relocate. Operations may also discourage inward investment, undermining the potential future development of land. Although this will depend on the location of the remote site and how the activities are perceived. There is a potential risk of accidental discharge of both radiological and non-radiological contaminants during SDP activities (refer to E. Geology and Soils), which could result in the contamination of land in the Devonport and Rosyth dockyards. Depending on the type and scale of contamination, this could undermine the developability of land in the dockyards as remediation may not be possible/economically viable. However, SDP activities would be closely regulated and subject to stringent environmental permitting requirements. Use of ALARP and BAT principles would also need to be adopted, so the risk of unacceptable or unplanned discharge is considered to be very low and there would be minimal risk of soil contamination during normal operations.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	-/+/?	-/+/?	-/+/?	The Devonport and Rosyth dockyards are well established dockyards, with existing facilities and infrastructure in place that are broadly compatible with dismantling requirements, although some modification to existing facilities and new build would be required. Where possible, existing facilities and infrastructure would be utilised at both dockyards, which would contribute positively towards sustainable land use. Modifications to existing facilities and the construction of new SDP facilities would require the use of natural resources, with the potential for impacts through the supply chain on limited or sensitive natural resources such as minerals, metals and timber products. However, for initial dismantling and segregation/size reduction taking account of existing facility provision and the scale of development required at the Devonport and Rosyth dockyards, resource requirements are not anticipated to be significant. There is likely to be opportunities to utilise existing infrastructure and resources, and to promote sustainable design and construction practices. SDP activities would require use of natural resources such as metals for additional shielding and water for dust suppression, jet blasting and cutting. Indirectly, natural resources would also be consumed in the manufacture of equipment, protective clothing etc. However, preparation and recycling activities will generate equipment for reuse and recyclates thereby

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				reducing the use of resources associated with their manufacture. There is the potential for routine and accidental discharges (both radiological and non-radiological) to affect resources such as water and soils, although Environmental Permitting requirements and containment mechanisms are expected to minmise the likelihood and consequences of this effect. As a remote site for interim storage has not been identified at this stage it is unknown whether interim storage activities would affect land use. Similarly, it is unknown whether there would be opportunity to utilise existing facilities and infrastructure for interim storage. Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. The potential impact on land use during construction for the PW option could therefore be greater than the RPV option but less than the RC option. Taking account of scale, resource use during construction could also be greater for the RPV option. However, this is dependant on facility design and build requirements, which have not been confirmed at this stage. Devonport Dockyard Devonport dockyard predominantly comprises buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is primarily made of reclaimed ground, with localised contamination (refer to E. Geology and Soils). It is assumed that SDP facilities and infrastructure would be located within the nuclear licensed site at the dockyard, with no additional land take required. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. To the south-west of Devonport dockyard, across the Hamoaze estuary, is the town of Torpoint. Plymouth City Council has identified a number of regeneration areas within Plymouth in their Core Strategy, which includes Devonport to the east of Devonport dockyard. Devonport is part of the City Centre & Waterfront Regeneration Area. Proposals for Devonport are set out in an Area Action Plan, which includes the development of a new centre, improving housing, and providing a better range of local services & facilities. Weston Mill, to the north-west of Devonport dockyard, is also identified in the Core Strategy as an area of regeneration. This area is being developed as a New District Centre, to rectify deficiencies in community facility provision. There is the potential for SDP activities at Devonport dockyard to have a negative effect on neighbouring land uses, including the regeneration of Devonport and Weston Mill, depending on how SDP activities at Devonport dockyard are perceived.
L. Land Use and Materials Contribute to the sustainable use of land and natural and material assets.	-/+/?	-/+/?	-/+/?	Rosyth Dockyard Devonport dockyard predominantly comprises buildings, dockyard infrastructure and hardstanding, dry docks and basins. It is understood that part of Rosyth dockyard is reclaimed land, which due to the nature of infill material used may be contaminated (refer to E. Geology and Soils). It is assumed that SDP facilities and infrastructure would be located within the nuclear licensed site at the dockyard, with no additional land take required. The area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing to the north-east, and agricultural land. The Draft Dunfermline & West Fife Local Plan includes a Settlement Planfor Rosyth, which promotes the development of Rosyth waterfront as a European Gateway and business park. Land to the east of Rosyth dockyard has been allocated for employment, community and leisure development. Land for a port container terminal has also been allocated to the west of Rosyth dockyard, and several sites around the town of Rosyth have been allocated for housing, including on Admiralty Road to the north of Rosyth dockyard. There is the potential for SDP activities at Rosyth dockyard to have a negative effect on neighbouring land uses, including the regeneration of Rosyth and development of the waterfront, depending on how SDP at Rosyth dockyard are perceived. **Comparison of the Options** Assuming that the Devonport and Rosyth dockyards require comparable facilities for SDP

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Depending on facility design and build requirements, Option 6/8D could therefore potentially result in greater resource use when compared to Option 6/8R, although no significant impacts on natural resources from construction are anticipated. There is not expected to be any difference in land take between the two dockyards, assuming that dismantling facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards, with no additional land take required. At both Devonport and Rosyth dockyard there is the potential for initial dismantling and segregation/size reduction activities to affect neighbouring land use patterns and regeneration initiatives, depending on how SDP activities at the dockyards is perceived. At this stage a remote site for interim storage has not been identified and subsequently the potential impact of interim storage activities on land use and materials is uncertain at this stage. The potential for effects would depend on the location and land use of the remote site, the scale of development required and the existing facilities and infrastructure in place. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined.

A13. Cultural Heritage

13.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on cultural heritage. Information is presented for both national and sub-regional levels.

Cultural heritage, including architectural and archaeological heritage, within this context is defined as below-ground and upstanding evidence of past human activity and encompasses artefacts, buried and underwater archaeological sites, earthworks, buildings, battlefields, historic gardens, historic landscapes, wrecks, hedgerows and ancient woodland.

There are links between the cultural heritage topic and other topics in the SEA, specifically landscape and material assets (land use and materials).

13.2 Summary of Plans and Programmes

13.2.1 International

The ***World Heritage Convention*** aims to promote co-operation amongst nations to protect heritage that is of such outstanding value that its conservation is important for current and future generations; and established a register of World Heritage Sites. It is intended that properties on the World Heritage List will be conserved for all time. Member states commit themselves to ensure the identification, protection, conservation, and presentation of World Heritage properties.

The World Heritage Committee's ***Operational Guidelines for the Implementation of the World Heritage Convention (2008)*** set out: the procedure from the inscription of properties on the World Heritage List and the List of World Heritage in Danger; the protection and conservation of World Heritage properties; the granting of International Assistance under the World Heritage Fund; and the mobilisation of national and international support in favour of the Convention.

The ***UNESCO Convention for the Protection of the Archaeological Heritage of Europe (revised)*** is a Europe-wide international treaty which establishes the basic common principles to be applied in national archaeological heritage policies. It supplements the general provisions of the ***UNESCO World Heritage Convention (1972)*** and aims to protect archaeological heritage as a source of the European collective memory and as an instrument for historical and scientific study. It sets out a framework which requires the member states to:

- maintain an inventory of archaeological heritage and designated protected monuments and areas;
- create archaeological reserves; and
- for finders of any element of archaeological heritage to report and make it available to the competent authority.

The ***European Convention on the Protection of the Archaeological Heritage (1992)*** made a number of important agreements including setting the definition of archaeological heritage as 'all remains and objects and any other traces of mankind from past epochs….shall include structures, constructions, groups of buildings, developed sites, moveable objects, monuments of other kinds as well as their context, whether situated on land or under water.

13.2.2 National

UK

The Department for Culture, Media and Sport White Paper ***Heritage Protection for the 21st Century (2007)*** sets out a strategy for protecting the historic environment, based on three core principles: developing a unified approach to the historic environment; maximising opportunities for inclusion and involvement; and supporting sustainable communities by putting the historic environment at the heart of an effective planning system.

At a national level, the draft ***Heritage Protection Bill*** contains provisions to unify the designation and consent regimes for terrestrial heritage assets, and transfer responsibility for designation of these assets. It also contains provisions to reform the marine heritage protection regime in England and Wales by broadening the range of marine historic assets that can be protected. The draft Bill is based on the proposals set out in the White Paper, Heritage Protection for the 21st Century (2007), and is one element of a wider programme of on-going heritage protection reforms. There are however, no current plans to enact the Bill and it is not known whether its provisions will become statute.

The ***Ancient Monuments and Archaeological Areas Act (1979)*** provides for the scheduling of ancient monuments and offers the only legal protection specifically for archaeological sites. The ***Planning***

(Listed Buildings and Conservation Areas) Act (1990) outlines the level of protection received by listed buildings, scheduled monuments and buildings within Conservation Areas.

There are a number of other Acts which afford protection to cultural and historical assets, including the ***Protection of Wrecks Act (1973)***, which provides protection for shipwrecks of historical, archaeological or artistic value; the ***Protection of Military Remains Act (1986)***, which provides protection for the wreckage of military aircraft and designated military vessels, and the ***Treasure Act (1996)***, which sets out procedures for dealing with finds of treasure, its ownership and rewards, in England, Wales and Northern Ireland.

MOD documents such ***as MOD Sustainable Development Strategy (2008), MOD Sustainable Development Report and Action Plan (2008)***, and ***MOD Heritage Report 2005-7*** include several objectives relevant to cultural heritage including to *'conserve and enhance the historic environment for the benefit of future generations and to reflect the ethos and heritage of the MOD'.*

England

Planning Policy Statement 5: Planning for the Historic Environment sets out the Government's planning policies on the conservation of the historic environment. This replaces ***Planning Policy Guidance 15: Planning and the Historic Environment*** and ***Planning Policy Guidance 16: Archaeology and Planning*** and puts greater emphasis on pre-application planning and discussion focusing on evaluating the significance of the heritage asset in question. PPS5 is supported by ***PPS5 Planning for the Historic Environment: Historic Environment Planning Practice Guide (2010)***, which has been developed to assist local authorities, owners, applicants and other interested parties in the implementation of PPS5.

The ***Government's Statement on the Historic Environment for England 2010*** underpins PPS5 and sets out the Government's vision for the historic environment for England. This vision states that *"the value of the historic environment is recognised by all who have the power to shape it; that Government gives it proper recognition and that it is managed intelligently and in a way that fully realises its contribution to the economic, social and cultural life of the nation".*

English Heritage, the Government's statutory adviser on the historic environment in England, have published a number of guidance documents for the protection of the historic environment, including ***Wind Energy and the Historic Environment (2005)***, ***Biomass Energy and the Historic Environment (2005)***, ***Climate Change and the Historic Environment (2005)*** and ***Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (2008)***.

Scotland

Natural Heritage (Scotland) Act 1991 Act established a body to be known as **Scottish Natural Heritage (SNH)** whose general aims and purposes were to secure the conservation and enhancement of the natural heritage of Scotland and to foster understanding and enjoyment of this heritage.

The ***Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997*** outlines the level of protection received by listed buildings, scheduled monument and buildings within conservation areas in Scotland.

Scottish Historic Environment Policy (2009) sets out Scottish Ministers' policies for the historic environment, including the following key outcomes:

- that the historic environment is cared for, protected and enhanced for the benefit of our own and future generations;
- to secure greater economic benefits from the historic environment; and
- the people of Scotland and visitors to our country value, understand and enjoy the historic environment.

Scotland's Culture (2006) sets out the Scottish Minister's vision for the strategic direction of future cultural policy and identifies key initiatives, legislation, investment and infrastructure changes needed to implement those decisions. The policy aims to provide support nationally for talent and excellence in culture and enable more people to enjoy culture; and to encourage more people to enjoy cultural activities locally by asking local authorities to develop cultural 'entitlements' for their area, to undertake cultural planning.

Policies in ***Scottish Planning Policy (SPP)*** reflect the importance of the historic environment, as a key part of Scotland's cultural heritage, to the Scottish Government's central purpose. With the careful application of policy and sensitive decision making, the historic environment can often be adapted to accommodate new uses, offering opportunities for new and creative design, whilst retaining its special character. In principle, therefore, the aim should be to identify the best viable use that is compatible with the fabric, setting and character of the historic environment.

Planning Advice Note 42 (PAN42) provides advice on the handling of archaeological matters within the planning process and on the separate controls over scheduled monuments under the Ancient Monuments and Archaeological Areas Act 1979. ***Planning Advice Note 71 (PAN71)*** identifies good practice for managing change, sets out a checklist for appraising conservation areas and provides advice on funding and implementation.

Wales

Planning Policy Wales has the following objectives regarding the historic environment;

- to preserve or enhance the historic environment, recognising its contribution to economic vitality and culture, civic pride and the quality of life, and its importance as a resource for future generations; and specifically to;
- to protect archaeological remains, which are a finite and non-renewable resource, part of the historical and cultural identity of Wales, and valuable both for their own sake and for their role in education, leisure and the economy, particularly tourism;
- to ensure that the character of historic buildings is safeguarded from alterations, extensions or demolition that would compromise a building's special architectural and historic interest; and
- to ensure that conservation areas are protected or enhanced, while at the same time remaining alive and prosperous, avoiding unnecessarily detailed controls over businesses.

Technical Advice Note 12: Design (TAN 12) sets out the Assembly Government's policies and objectives in respect of the design of new development, including sustaining or enhancing local character.

Northern Ireland

The ***Planning (Northern Ireland) Order 1991*** gives power to designate conservation areas, control over the demolition of unlisted buildings in conservation areas, sets out a requirement to list buildings and powers to protect them. The ***Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995*** provides for the scheduling of historic monuments into State Care, licensing of archaeological excavations and reporting finds.

The ***Planning (Conservation Areas) (Demolition) Regulations (Northern Ireland) 1988***, and ***Planning (Listed Buildings) Regulations (Northern Ireland) 1992*** outline the level of protection received by buildings within conservation areas and listed buildings in Northern Ireland respectively.

Planning Policy Statement 6: Archaeology and the Built Heritage (PPS6) sets out planning policies for the protection and conservation of archaeological remains and features of the built heritage. The PPS comprises planning policies covering archaeological sites and monuments, World Heritage Sites, historic parks, gardens and demesnes, listed buildings and conservation areas.

Architecture and the Built Environment for Northern Ireland (2006) details the Department of Culture, Arts and Leisure's policy statement on architecture and the built environment. Under this document, the Government is committed to increase built design standards and promote planning policies focused on architectural quality, good urban and rural design.

Shaping Our Future: Regional Development Strategy for Northern Ireland 2025 aims to guide the future development of Northern Ireland to 2025. Policy ENV3 within the strategy seeks to conserve the built environment by:

- safeguarding archaeological resource;
- safeguarding buildings of special architectural or historic interest;
- conserving the character of cities, towns and villages;
- conserving parks, gardens and demesnes which are of historic interest; and
- promoting the retention of vernacular buildings and industrial heritage features in urban and rural areas

The ***Northern Ireland Environment Agency Business Plan 2010-2011*** sets out the Northern Ireland Environment Agency's (NIEA) contribution to the final year of the Executive's Programme for Government 2008-11. Relevant to cultural heritage, the Business Plan includes an objective to*"improve the condition of our monuments and listed buildings, including structures currently on the Built Heritage at Risk Register".*

13.2.3 Sub-regional locations

Plymouth

Strategic Objective 8 within the ***Plymouth Core Strategy*** aims to facilitate the creation of Plymouth as a vibrant waterfront city with a thriving cultural and leisure sector and a diverse, safe, balanced and socially inclusive evening/night economy. This will be achieved by:

- establishing and promoting one or more sustainable cultural quarters as centres for arts, culture and entertainment for the city;
- promoting the waterfront regeneration areas as locations for leisure, culture and entertainment amenities;
- promoting the development of the Life Centre at Central Park;
- promoting local culture and leisure venues in other parts of the city to enhance local provision; and

- promoting the development of a balanced evening/night-time economy within the City Centre and waterfront regeneration areas.

A Strategy for the Historic Environment in the South West (2004) by English Heritage aims to promote the importance of the Historic Environment on the success of the region.

Fife

Policy SS1: Settlement Development Strategy of the Fife Structure Plan 2006-2026 sets out the sustainable development strategy for Fife. Under Policy SS1, in identifying sites for development in Local Plans, and in the assessment of other proposals, the Council will have regard to the protection of built heritage or natural environment features.

Policy ENV1 of the Fife Structure Plan affords protection to the built environment. The policy requires the character, appearance of setting of designated built or cultural heritage sites to be protected from harmful development and requires local plan policies to provide protection for the built and historic environment and for archaeology.

13.3 Overview of the Baseline

13.3.1 National

UK

The UK has over 459,000 listed buildings, approximately 33,720 scheduled monuments, 2416 historic parks and gardens, in excess of 10,259 conservation areas and 28 World Heritage Sites.[261]

In 2008/09, the MOD's historic estate comprised 797 listed buildings and 737 scheduled monuments[262]. In 2009, 34 listed buildings were Grade I; 134 were Grade II*; and 629 were Grade II[263]. At March 2009 the MOD reported that 89% of the listed buildings and 80% of the scheduled monuments were in either good or fair condition[264, 265]

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[261] Department of Culture, Media and Sport, 2009, http://www.culture.gov.uk/4168.aspx

[262] MOD, Stewardship Report on the Defence Estates, 2008-09, http://www.mod.uk/NR/rdonlyres/F9E34976-9E39-4E0D-BADA-157975DF2118/0/stewardshiprpt200809v7.pdf

[263] MOD Heritage Report 2007 – 2009, http://www.mod.uk/NR/rdonlyres/D0EEBC4D-5982-4C9F-BA4A-555936E544CD/0/heritage_report_0709.pdf

[264] MOD Sustainable Development Report and Action Plan 2009 http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/HealthandSafetyPublications/SSDCD/SustainableDevelopmentPolicy/SustainableDevelopmentStrategyReportsAndActionPlans.html

In 2007 the MOD had 28 Buildings at Risk entries. Since that report three buildings have been removed from the list (one by repair, one by disposal and one by transfer to English Partnerships) and three have been added.

A number of MOD sites have been placed on the English Heritage and Historic Scotland Registers of Parks and Gardens. These include: Halton House and Gardens; Chicksands Priory; RAF Bentley Priory; Amport House and Gardens; Minley Manor; Royal Naval Hospital, Haslar; Craigiehall and RAF Leuchars.

A number of MOD sites are within the boundaries of nine World Heritage Sites. (Cornwall and West Devon Mining Landscape; Derwent Valley Mills; Edinburgh World Heritage Site; Liverpool - Maritime Mercantile City; The Tower of London; Stonehenge, Avebury and Associated Sites; Hadrian's Wall; St Kilda World Heritage Site; and City of Bath).[266]

Parts of the MOD estate lie within conservation areas, including: RAF Bicester; RAF Hullavington; HMNB Portsmouth; Gosport; and RMA Sandhurst.

England

In England there are approximately 374,081 listed building entries, 19,717 scheduled monuments, 1,601 registered historic parks and gardens, 9,080 conservation areas, 43 registered historic battlefields, 46 designated wrecks and 17 World Heritage Sites. Nearly 19,446 sites in England are 'at risk'.

The density of shipwreck remains in the English territorial sea is amongst the highest in the world due to the combined effects of historically high volumes of shipping traffic, a long history of seafaring and an often hazardous coastline.[267]

English Heritage have identified the following proportions of heritage sites as at risk within England:

- 3.1% of grade I and II listed buildings;
- 7.4% of conservation areas (from those that were included within the report);
- 17.2% of scheduled monuments;
- 6.1% of registered parks and gardens;

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[265] MOD, Stewardship Report on the Defence Estates, 2008-09, http://www.mod.uk/NR/rdonlyres/F9E34976-9E39-4E0D-BADA-157975DF2118/0/stewardshiprpt200809v7.pdf
[266] MOD, Heritage Report 2006-07, http://www.defence-estates.mod.uk/publications/corporate/MODHeritateReport2005-2007final.pdf
[267] English Heritage, http://www.english-heritage.org.uk/caring/listing/what-can-we-protect/listed-buildings/

- 14% of registered battlefields, and;
- 17% of protected wreck sites.[268]

Scotland

In Scotland there are approximately 8,089 scheduled monuments[269], in excess of 47,000 listed buildings[270], in excess of 600 conservation areas, five World Heritage Sites, and more than 275 sites listed in the Inventory of Historic Parks, Gardens and Designed Landscapes. 2,360 sites in England are currently ‘at risk’.[271]

Historic Scotland have identified 8.2% of Scotland’s A-listed buildings (3,681) as ‘at risk’ within the Buildings at Risk Register (BARR). This is a decrease from 2009 when 8.7% were at risk. 63.3% of these buildings are located in urban areas or small towns.[272]

Wales

In Wales there are approximately 4,111 Scheduled Monuments[273], 29,889 listed buildings, 519 conservation areas, three World Heritage Sites, 386 registered parks and gardens, and six designated historic wrecks. There are currently 127 monuments in state care in Wales.

A 2008 report for Cadw found that for a sample percentage of listed buildings in Wales, 9.6% were classed as being ‘at risk’.

Northern Ireland

In Northern Ireland there are approximately 1,803 scheduled monuments[274], 8,350 Listed Buildings, 60 conservation areas, one World Heritage Site, 334 registered battlefields[Error! Bookmark not defined.], and 154 registered historic parks, gardens and demesnes.[275]

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[268] English Heritage, 2010, Heritage at Risk Summary, http://www.english-heritage.org.uk/publications/har-2010-summary/

[269] Historic Scotland, http://www.historic-scotland.gov.uk/index/ancientmonuments/searchmonuments.htm

[270] Scottish Government, 2010, Land Use Strategy, Strategic Environmental Assessment Screening and Scoping Report, http://www.scotland.gov.uk/Resource/Doc/1051/0095735.pdf

[271] The Scottish Civic Trust, 2010, Buildings at Risk: Register for Scotland, http://www.buildingsatrisk.org.uk/BAR/

[272] Historic Scotland 2011, Buildings at Risk Register National Report 2011, http://www.historic-scotland.gov.uk/barrnationalreport2011.pdf

[273] StatsWales, 2008, State of the Environment Indicator 26 http://www.statswales.wales.gov.uk/TableViewer/document.aspx?ReportId=6001

[274] Department of the Environment, 2010, Northern Ireland Environmental Statistics Report

[275] Northern Ireland Environment Agency, 2010, Protecting our Built Heritage, http://www.ni-environment.gov.uk/built-home/protection/international_heritage.htm

437 buildings and monuments were recognised as at risk in 2008 within Northern Ireland.[276]

13.3.2 Sub-regional locations

Plymouth

In Plymouth there are 37 scheduled monuments, predominantly connected with military history, including three scheduled monuments within HMNB Devonport (four scheduled monuments in the South Yard, and one in Bull Point).[277]

Plymouth has over 750 listed buildings[278]. There are 85 listed buildings in HMNB Devonport, two of which are Grade I and 23 of which are Grade II* listed, which is over 11% of the total number of 750 listed buildings in Plymouth. The listed buildings are predominantly located in South Yard and Bull Point, as follows:[279]

Table 13.1 Listed Buildings in HMNB Devonport

Column Heading	Grade I	Grade II*	Grade II	Total
South Yard	1	13	19	33
Morice Yard	0	7	7	14
North Yard	1	1	2	4
HMS Drake	0	1	13	14
Bull Point	0	1	19	20
TOTAL				**85**

Many of Plymouth's most important buildings are associated with the Dockyard, such as the Royal William Yard and Naval Hospitals and are listed as Grade II* or Grade I reflecting their significance.[280]

[276] Department of the Environment, 2010, Northern Ireland Environmental Statistics Report
[277] Plymouth City Council, Scheduled Ancient Monuments, http://www.plymouth.gov.uk/homepage/creativityandculture/heritageandhistory/historicenvironment/scheduledancientmonuments.htm
[278] Plymouth City Council, Heritage, http://www.plymouth.gov.uk/homepage/creativityandculture/heritageandhistory/historicenvironment/listedbuildings.htm
[279] English Heritage – feedback received on the Stage 'A2' SEA Scoping Report, 2011.
[280] Plymouth City Council, Heritage, http://www.plymouth.gov.uk/homepage/creativityandculture/heritageandhistory/historicenvironment/listedbuildings.htm

In Plymouth there are 14 conservation areas designated for their special architectural or historic interest.[281]

Plymouth has six registered parks and gardens, five are Grade II (Civic Square; Devonport Park; Ford Park Cemetery; The Hoe, and Plympton House) and one is Grade II* (Saltram House).[282]

There are 22 sites at risk within Plymouth Unitary Authority on the 2010 English Heritage Register, of which 11 are buildings at risk and 11 are scheduled monuments at risk (although some of the 'buildings at risk' are scheduled.[283, 284]

Of the buildings at risk, one is grade I and six are grade II*. Two of the buildings at risk in Plymouth (South Smithery and South Sawmills, both grade II*) are owned by the MOD and are sited in HMNB Devonport in South Yard. In addition, English Heritage's Biennial Conservation Report[6] also identifies the Master Ropemaker's House (grade II) in South Yard as being at risk. All three of these buildings in the dockyard are unoccupied.

Plymouth City Council also maintain a buildings at risk register (BAR), which provides information on buildings and structures throughout the city that are considered to be 'at risk'. The 2005 Plymouth City Council BAR contains details of 412 buildings or structures considered to be at risk. Of these buildings and structures, 124 are statutory listed (5 Grade I, 15 Grade II* and 104 Grade II listed). 20 scheduled ancient monuments are included and the remaining 266 entries are buildings/structures considered to be of townscape merit. They are included for their positive contribution locally to the built environment and/or their historic importance.[285]

Fife

In Fife are there 260 scheduled monuments[286], 4,910 listed buildings, 48 conservation areas, two designated wreck sites, 25 archaeological areas of regional importance, 31 garden and designed landscapes sites.

In 2006 there were 79 registered Buildings at Risk in Fife, which composed of the following:

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[281] Plymouth City Council, Conservation areas http://www.plymouth.gov.uk/homepage/creativityandculture/heritageandhistory/historicenvironment/conservationareas.htm
[282] Plymouth City Council, Registered Parks and Gardens. http://www.plymouth.gov.uk/homepage/creativityandculture/heritageandhistory/historicenvironment/registeredparks.htm
[283] English Heritage, At Risk Register http://risk.english-heritage.org.uk/2010.aspx?rs=1&rt=0&pn=1&st=a&ua=Plymouth%2c+City+of+(UA)&ctype=all&crit=
[284] English Heritage – feedback received on the Stage 'A2' SEA Scoping Report, 2011.
[285] Plymouth City Council Buildings At Risk, http://www.plymouth.gov.uk/homepage/creativityandculture/heritageandhistory/historicenvironment/buildingsatrisk.htm
[286] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1

- 47 buildings at risk;
- 17 demolished buildings;
- 4 buildings in restoration;
- 9 scheduled ancient monuments; and
- 2 buildings on alert.

There is prolific evidence of early settlement throughout the entire area of Fife.[287]

13.4 Existing problems

13.4.1 National

UK

Although from 2000 to 2007 there has been a steady decrease in the number of buildings identified as at risk, for the first time between 2007 and 2008, the number of entries within the Buildings at Risk Register rose for the first time.[288] Furthermore, the average cost of repairing each building on the Register has steadily increased.

Redundancy is a major factor driving listed buildings into risk. The kinds of historic buildings now at greatest risk are those associated with defence (15%), agriculture (8%) and manufacturing industry (13%).

There are concerns that the current recession will reduce public spending which will further reduce conservation staff for local authorities and reduce grants and subsidies to problem sites at a time when there will be an reduction in the willingness of developers to take on more challenging buildings at risk, an increase in vacancy rates and a decrease in funds owners will be abele to invest in repair and maintenance.

[287] Scottish Natural Heritage, Fife Landscape Character Assessment, 1999, http://www.snh.org.uk/publications/on-line/LCA/fife.asp
[288] English Heritage, Heritage at Risk Report 2010, http://www.english-heritage.org.uk/publications/har-2010-report/

13.4.2 Sub-regional locations

Plymouth

Under-use of many of the MOD's designated dockyard buildings (not only those formally identified as being at risk) is a significant cultural issue for Plymouth.[289]

Fife

Threats to cultural heritage in Fife include a permanent setting change from mineral extraction and further urban development.[290]

13.5 Likely evolution of the baseline

13.5.1 National

UK

There is a trend of improving condition of MOD cultural heritage assets[291]. Between 2005/06 and 2008/09 there was a 28% increase in the number of MOD scheduled monuments either in good or fair condition[292]. There is currently little change in the number of MOD buildings at risk.[293]

England

The current trend in cultural heritage condition is generally towards little change in the number of historic assets and a decline in the percentage that are at risk.[294]

English Heritage report that there has been little change in the total number of historic assets between 2002 and 2009; the total number of listed buildings in England has increased by 0.9% during this period with the largest increase in Grade II* (1.4%). The number of scheduled monuments has increased by 1.9% over the same period whilst registered parks and gardens increased by 7.3% (104) between 2002 and 2009. The number of scheduled monuments increased by 1.9% between 2002 and 2009.[295]

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[289] English Heritage – feedback received on the Stage 'A2' SEA Scoping Report, 2011.
[290] Scottish Natural Heritage, Fife Landscape Character Assessment, 1999, http://www.snh.org.uk/publications/on-line/LCA/fife.asp
[291] MOD Heritage Report 2005/07 http://www.defence-estates.mod.uk/publications/corporate/MODHeritateReport2005-2007final.pdf
[292] MOD Heritage Report 2007/2009, http://www.mod.uk/NR/rdonlyres/D0EEBC4D-5982-4C9F-BA4A-555936E544CD/0/heritage_report_0709.pdf
[293] MOD, Stewardship Report on the Defence Estates, 2007-08, http://www.defence-estates.mod.uk/estate/estatestrategy.php
[294] http://www.english-heritage.org.uk/hc/upload/pdf/HC08_National_Acc.pdf)
[295] English Heritage, Heritage Counts 2009, England, http://hc.english-heritage.org.uk/upload/pdf/HC09_England_Acc.pdf?1286268742

Scotland

There has been a reduction in the proportion of A-listed buildings which are entered on the Buildings at Risk Register (BARR) from 8.7% in 2009 (277 out of 3,199) to 8.2% in 2011 (267 out of 3,245).

Wales

In Wales there has been a small increase in the number of listed buildings (29,866 to 29,889), scheduled monuments (3,909 to 4,111) and conservation areas (511 to 519) between 2006 and 2008. A 2008 report for Cadw found that for a sample percentage of listed buildings in Wales between 2007 and 2008, those classed as 'at risk' fell slightly from 10.2% to 9.6% ; those classed as 'vulnerable' fell slightly from 17.5% to 17.3%; and those classed as 'not at risk' increased slightly from 72.4% to 73.2%.[296]

Northern Ireland

In Northern Ireland there has also been a small increase in scheduled monuments (1,423 in 1999/2000 to 1,803 in 2008/09), listed buildings (8,184 in 2003/04 to 8,350 in 2008/09) and conservation areas (57 to 60 between 2002/03 and 2008/09). The number of buildings and monuments at risk has increased between 2003/04 and 2008/09 by approximately 16% to 437. [297]

13.5.2 Sub-regional locations

Plymouth

No Plymouth trend data has been identified.

Fife

No Fife trend data has been identified. However, there are a number of relevant targets relating to heritage within the Fife Structure Plan 2006 - 2026 which identify the importance of the historic environment, including to:

- protect and, where appropriate, enhance or restore the historic environment;
- preserve historic buildings, archaeological sites and other culturally important features;
- promote access to the historic environment; and

[296] StatsWales, 2008, State of the Environment Indicator 26 http://www.statswales.wales.gov.uk/TableViewer/document.aspx?ReportId=6001
[297] Department of the Environment, 2010, Northern Ireland Environmental Statistics Report

- improve the enjoyment and understanding of the historic environment.[298]

13.6 Assessment objective, guide questions and significance

The objective and guide questions related to cultural heritage that have been used in the assessment of the effects of the SDP are set out in Table 13.1, together with reasons for their selection.

Table 13.1 Approach to assessing the effects of SDP on cultural heritage

Objective/guide question	Reasoning
Objective: Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features.	The SEA Directive requires that the likely significant effects on cultural heritage including architectural and archaeological heritage should be taken into account in the Environmental Report
Will the SDP Proposals affect designated or locally-important archaeological features?	A number of legislative provision require the protection of sites designated for archaeological or cultural heritage importance including Ancient Monuments and Archaeological Areas Act and Planning (Listed Buildings and Conservation Areas) Act.
Will the SDP Proposals affect the fabric and setting of historic buildings, places or spaces that contribute to local distinctiveness, character and appearances?	PPS15 requires the protection of the most important components of historic landscapes and encourages development that is consistent with maintaining its overall historic character.

Table 13.2 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the cultural heritage objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 13.2 Approach to determining the significance of effects on cultural heritage

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option would make a significant positive and long-term contribution to the setting and conservation of designated and locally important cultural heritage features (e.g. – through enhancement of setting, permanent removal of a structure creating a negative visual impact, large scale enhancement of designated features).
+	Positive	• Option would bring minor short-term improvements to the setting and conservation of designated cultural heritage features (e.g. - temporary removal of structure creating a negative visual impact).

[298] Fife Council, Fife Structure Plan 2006 - 2026 Post Adoption SEA 2010, http://www.fifedirect.org.uk/uploadfiles/publications/c64_PostAdoption-FinalisedPostAdoptionSEAStatement-January20101.pdf

Effect	Description	Illustrative Guidance
0	No (neutral effects)	• Option would not have any significant effects on any cultural heritage sites or assets.
-	Negative	• Option would bring minor short-term degradation to the setting and conservation of designated cultural heritage features (e.g. – temporary use of equipment/structures creating a negative visual impact).
--	Significant negative	• Option would cause long-term degradation to the setting and conservation of designated and locally important cultural heritage features (e.g. – through direct and permanent loss or damage to designated sites, introduction of a structure that will have a considerable and permanent negative visual impact).
?	Uncertain	• From the level of information available the effects the impact that the option would have on this objective is uncertain.

13.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the cultural heritage objective. **Table 13.3** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 13.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 13.4** below.

Table 13.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than 'greenfield' sites, although it is recognised that 'brownfield' land can be important for

Category	Assumption Description
	conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m^2. Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2 . As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average). • It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine

Category	Assumption Description
	• It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since breaking a cleared submarine is little different to breaking a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be transported from the initial dismantling facility to the interim storage facility by sea, rail or

Category	Assumption Description
	road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in **Table 13.3** are considered in-turn below.

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities Cultural Heritage
Option 1: Develop a Greenfield Site for Submarine Dismantling

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities

Cultural Heritage

Assessment of Effects:

Construction activities, in particular construction of the landside facilities and infrastructure could result in the direct loss of or damage to visible above ground cultural heritage or archaeological features within the development footprint of the surface site area. Construction activities may also have a negative effect on the setting and amenity of above ground historic or archaeological features and landscapes (e.g. world heritage sites, conservation areas, listed buildings, scheduled monuments and registered parks and gardens) within the vicinity.

Construction activities (e.g. stripping topsoil, site levelling, digging foundations, piling works, drilling and excavations) have the potential to result in the direct loss of or cause damage to subsurface or buried archaeological remains. This may include known archaeology (such as designated or recorded sites) or previously unknown archaeology.

There is also potential that dredging may affect seabed archaeology sites or remains.

There could also be the potential for indirect damage to subsurface or buried archaeological remains due to contamination, ground consolidation, or changes to the hydrological regime.

There would be the potential for pollution from engine exhausts and vibration associated with any increase in rail traffic or road traffic (particularly HGVs in the case of road traffic) over the construction period to have a negative effect on historic or archaeological features (e.g. listed buildings).

It is expected that more ground disturbing activities will be required for Option 1 than the other options due to the scale and footprint of the required infrastructure and ancillary facilities as well as the dismantling/size reduction facilities.

To identify the importance of cultural heritage or archaeological features that may be at risk from activities relating to the SDP programme it will be important to ensure that where possible, an assessment of the significance of an asset should be undertaken prior to commencement of any site specific activities

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities and infrastructure (e.g. roads, car parking, security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale of construction would be reduced under RC/RPV storage options in the short term, it is expected that associated disturbance of cultural heritage assets would also be less relative to PW storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further disturbance would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.

Proposed Mitigation / Enhancements Measures:

- It is anticipated that any significant detrimental effects arising from the construction of greenfield sited SDP facilities on cultural heritage and archaeology, including subsurface and buried archaeology and traditional activities may be minimised through early liaison with, and adhering to guidance issued by English Heritage, LPA and other appropriate organisations.
- At an early stage following site selection and prior to any works on site, a Desk Based Assessment and site walkover should be undertaken to determine the historic and archaeological value of the site in consultation with English Heritage, the relevant local authority heritage officer and other relevant bodies (it is expected that a Desk Based Assessment and walkover would have been undertaken as part of the surface-based site investigation works, which could be revised and updated as necessary for the construction phase). The Desk Based Assessment and site walkover would identify the need for further site evaluation (i.e. hedgerow surveys; field surface collection; monitoring and assessment of geotechnical work including a watching brief on geotechnical test pits; geophysical survey; trial trenching; and other

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities **Cultural Heritage**	
specialist surveys). • In addition to the assessment of effects on archaeological and built heritage features, the effect on historic landscapes should also be considered. This should include characterisation of the landscape and effects on any contribution that the heritage resource may make to tourism in the area. • Where there is the potential for adverse effects on cultural heritage and archaeology, surface infrastructure and facilities and excavated rock spoil should be appropriately sited to reduce any negative effects and the development footprint minimised as far as practically possible. • Further mitigation might include alterations to the construction methodology (e.g. foundation design and excavation methods) in order to minimise effects or the retention of historic or archaeological features in situ. The potential for contamination can be minimised by following best practice pollution prevention methods. • If retention of any features is not possible, consideration should be given to storage, or a detailed excavation and recording of the affected feature should be undertaken. A watching brief is recommended during topsoil stripping and excavation in order to identify any unexpected features or artefacts arising during construction. If any archaeological features or artefacts are discovered, this may also require a temporary suspension of any intrusive activities in the affected area of the site. • Identifying appropriate routes to access the site would help to minimise potential negative effects on historic or archaeological features (e.g. listed buildings) caused by transport pollution and vibration.	
Summary: Option 1 has been assessed as having a negative impact on this objective as construction activities, including dredging have the potential to negatively impact archaeological features both on site and within the vicinity, either by direct loss or damage or by affecting the settings and amenity. Subsurface or buried archaeological remains may be affected by contamination, ground consolidation, or changes to the hydrological regime during construction. There is also a potential for pollution from engine exhausts or vibration generated through increased traffic to negatively impact on features. However, as the option is not site specific the location of cultural features, such as World Heritage Sites, Listed Buildings and Registered Monuments, is not known it is not possible to say with certainty whether these impacts are likely to be significant or minor. Under RC/RPV storage options construction of the size reduction facility would be delayed and therefore, it is expected that associated disturbance of cultural heritage assets would also be less in the short term relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further disturbance would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.	**-/--**
Option 2: Develop Brownfield Site for Submarine Dismantling	
Assessment of Effects: The overall scale of construction is considered to be less for Option 2 than Option 1, as the majority of ancillary infrastructure will be in place. However, each of the effects identified for greenfield site (including loss or damage to archaeological features through pollution, vibration, contamination, changes to hydrological regime or dust generation) still have the potential to have a negative impact depending on presence of historic features on site or in the surrounding area. Within brownfield sites the above ground archaeological features most likely to be affected potentially include listed buildings within the development footprint of the surface site area. Furthermore, construction activities may also have a negative effect on the setting and amenity of above ground historic or archaeological features and landscapes (e.g. world heritage sites, conservation areas, listed buildings, scheduled monuments and registered parks and gardens) within the vicinity and adjacent sites. Buried archaeological remains may also be lost or damaged through construction activities, such as site levelling, piling and excavations.	

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities	
Cultural Heritage	

Dredging activities are also expected for Option 2, although to a lesser extent than Option 1, therefore there is potential that dredging may affect seabed archaeology sites or remains.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on a brownfield site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities (e.g. security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale of construction would be reduced under RC/RPV storage options in the short term, it is expected that associated disturbance of cultural heritage assets would also be less relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further disturbance would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.

Proposed Mitigation / Enhancements Measures:

- It is anticipated that any significant detrimental effects arising from the construction of a brownfield sited SDP facility on cultural heritage and archaeology, including subsurface and buried archaeology and traditional activities may be minimised through early liaison with, and adhering to guidance issued by English Heritage, LPA and other appropriate organisations.
- At an early stage following site selection and prior to any works on site, a Desk Based Assessment and site walkover should be undertaken to determine the historic and archaeological value of the site in consultation with English Heritage, the relevant local authority heritage officer and other relevant bodies (it is expected that a Desk Based Assessment and walkover would have been undertaken as part of the surface-based site investigation works, which could be revised and updated as necessary for the construction phase). The Desk Based Assessment and site walkover would identify the need for further site evaluation (i.e. hedgerow surveys; field surface collection; monitoring and assessment of geotechnical work including a watching brief on geotechnical test pits; geophysical survey; trial trenching; and other specialist surveys).
- In addition to the assessment of effects on archaeological and built heritage features, the effect on historic landscapes should also be considered. This should include characterisation of the landscape and effects on any contribution that the heritage resource may make to tourism in the area.
- Where there is the potential for adverse effects on cultural heritage and archaeology, surface infrastructure and facilities and excavated rock spoil should be appropriately sited to reduce any negative effects and the development footprint minimised as far as practically possible.
- Further mitigation might include alterations to the construction methodology (e.g. foundation design and excavation methods) in order to minimise effects or the retention of historic or archaeological features in situ. The potential for contamination can be minimised by following best practice pollution prevention methods.
- If retention of any features is not possible, consideration should be given to storage, or a detailed excavation and recording of the affected feature should be undertaken. A watching brief is recommended during topsoil stripping and excavation in order to identify any unexpected features or artefacts arising during construction. If any archaeological features or artefacts are discovered, this may also require a temporary suspension of any intrusive activities in the affected area of the site.
- Identifying appropriate routes to access the site would help to minimise potential negative effects on historic or archaeological features (e.g. listed buildings) caused by transport pollution and vibration.

Summary: Option 2 has been assessed as having a negative impact on this objective as construction activities, including dredging, have the potential to negatively impact listed buildings on site and other archaeological features found in adjacent sites, either by	**-/?**

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities Cultural Heritage	
direct loss or damage or by affecting the settings and amenity. Subsurface or buried archaeological remains may be affected by contamination, ground consolidation, or changes to the hydrological regime during construction. There is also a potential for pollution from engine exhausts generated through increased traffic to negatively impact on features. Although the scale of construction will be less than for Option 1, the same uncertainties remain associated to the site and location of archaeological features, therefore, the potential remains for a negative effect. Under RC/RPV storage options construction of the size reduction facility would be delayed and therefore, it is expected that associated disturbance of cultural heritage assets would also be less relative to the Packaged Waste option (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further disturbance would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.	

Option 3: Develop Licensed/Authorised Site for Submarine Dismantling

Assessment of Effects:

It is expected that sufficient infrastructure and ancillary facilities will be in place in a Licensed/Authorised site to accommodate SDP facilities such that the scale of construction will be less for Option 3 than the other site options. However, each of the effects identified for the other site options (including loss or damage to archaeological features through pollution, vibration, contamination, changes to hydrological regime or dust generation) still have the potential to have a negative impact depending on presence of historic features on site or in the surrounding area.

Within Licensed/Authorised sites the above ground archaeological features most likely to be affected potentially include listed buildings within the development footprint of the surface site area. Furthermore, construction activities may also have a negative effect on the setting and amenity of above ground historic or archaeological features and landscapes (e.g. world heritage sites, conservation areas, listed buildings, scheduled monuments and registered parks and gardens) within the vicinity and adjacent sites. Buried archaeological remains may also be lost or damaged through construction activities, such as site levelling, piling and excavations.

Dredging activity, if necessary, may affect seabed archaeology sites or remains.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on an existing Licensed/Authorised site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities (e.g. security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale of construction would be reduced under RC/RPV storage options in the short term, it is expected that associated disturbance of cultural heritage assets would also be less relative to the Packaged Waste storage option (which would require construction of all dismantling and size reduction facilities 'up front'). However, under RC/RPV storage options further disturbance would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.

Proposed Mitigation / Enhancements Measures:

- It is anticipated that any significant detrimental effects arising from the construction of a greenfield sited SDP facility on cultural heritage and archaeology, including subsurface and buried archaeology and traditional activities may be minimised through early liaison with, and adhering to guidance issued by English Heritage, LPA and other appropriate organisations.
- At an early stage following site selection and prior to any works on site, a Desk Based Assessment and site walkover should be undertaken to determine the historic and archaeological value of the site in consultation with English Heritage, the relevant local authority heritage

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities Cultural Heritage	
officer and other relevant bodies (it is expected that a Desk Based Assessment and walkover would have been undertaken as part of the surface-based site investigation works, which could be revised and updated as necessary for the construction phase). The Desk Based Assessment and site walkover would identify the need for further site evaluation (i.e. hedgerow surveys; field surface collection; monitoring and assessment of geotechnical work including a watching brief on geotechnical test pits; geophysical survey; trial trenching; and other specialist surveys). • In addition to the assessment of effects on archaeological and built heritage features, the effect on historic landscapes should also be considered. This should include characterisation of the landscape and effects on any contribution that the heritage resource may make to tourism in the area. • Where there is the potential for adverse effects on cultural heritage and archaeology, surface infrastructure and facilities and excavated rock spoil should be appropriately sited to reduce any negative effects and the development footprint minimised as far as practically possible. • Further mitigation might include alterations to the construction methodology (e.g. foundation design and excavation methods) in order to minimise effects or the retention of historic or archaeological features in situ. The potential for contamination can be minimised by following best practice pollution prevention methods. • If retention of any features is not possible, consideration should be given to storage, or a detailed excavation and recording of the affected feature should be undertaken. A watching brief is recommended during topsoil stripping and excavation in order to identify any unexpected features or artefacts arising during construction. If any archaeological features or artefacts are discovered, this may also require a temporary suspension of any intrusive activities in the affected area of the site. • Identifying appropriate routes to access the site would help to minimise potential negative effects on historic or archaeological features (e.g. listed buildings) caused by transport pollution and vibration.	
Summary: Option 3 has been assessed as having a negative impact on this objective as construction activities, including dredging, have the potential to negatively impact listed buildings on site and other archaeological features found in adjacent sites, either by direct loss or damage or by affecting the settings and amenity. Subsurface or buried archaeological remains may be affected by contamination, ground consolidation, or changes to the hydrological regime during construction. There is also a potential for pollution from engine exhausts generated through increased traffic to negatively impact on features. Although the scale of construction will be less than for Option 1 and 2, the same uncertainties remain associated to the site and location of archaeological features, therefore, the potential remains for a negative effect. Under RC/RPV storage options construction of the size reduction facility would be delayed and therefore, it is expected that associated disturbance of cultural heritage assets would also be less relative to Packaged Waste storage option (which would require construction of all dismantling and size reduction facilities ‘up front’). However, under RC/RPV storage options further disturbance would be associated with the construction of the size reduction facility and associated infrastructure/ancillary facilities in the longer term.	**-/?**

Stage II : Designing and Developing the Interim ILW Storage Facilities

Cultural Heritage

Option 1: Develop Greenfield Site for ILW Storage

Assessment of Effects:

Given the generic nature of the construction proposals for the interim storage facility, it is assumed that the potential effects associated with this objective will be largely similar as for Stage 1 (construction of dismantling and size reduction facilities).

Construction activities, in particular construction of the landside facilities and infrastructure could result in the direct loss of or damage to visible above ground cultural heritage or archaeological features within the development footprint of the surface site area. Construction activities may also have a negative effect on the setting and amenity of above ground historic or archaeological features and landscapes (e.g. world heritage sites, conservation areas, listed buildings, scheduled monuments and registered parks and gardens) within the vicinity.

Construction activities (e.g. stripping topsoil, site levelling, digging foundations, piling works, drilling and excavations) have the potential to result in the direct loss of or cause damage to subsurface or buried archaeological remains. This may include known archaeology (such as designated or recorded sites) or previously unknown archaeology.

There is also potential that dredging may affect seabed archaeology sites or remains.

There could also be the potential for indirect damage to subsurface or buried archaeological remains due to contamination, ground consolidation, or changes to the hydrological regime.

There would be the potential for pollution from engine exhausts and vibration associated with any increase in rail traffic or road traffic (particularly HGVs in the case of road traffic) over the construction period to have a negative effect on historic or archaeological features (e.g. listed buildings).

It is expected that the scale of construction on a greenfield site will be greater than for the other options as it is assumed that all/most of the infrastructure and ancillary features will be required, including but not restricted to; docks, rail head, roads, cranes, inspection and maintenance facilities and admin offices. As a result the risk of affecting above ground or sub-surface/buried archaeological features either directly or indirectly as described above will be greater than the other options.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well as reception, admin, dispatching, inspection and maintenance areas. Additional infrastructure will also be required under this land use option such as docking facilities, security (standoff and centre), car parking, roads and internal rail line although the total area required for these additional features is unknown.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities, car parking and roads will also be required under this land use option. Should RPVs be transported by sea (which is the most likely option) then docking facilities will also be required.
- Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Additional infrastructure including security (standoff and centre), car parking, roads and an external rail line (if required), will also be required under this land use option. As packaged waste is likely to be transported by either road or rail it is assumed that there will be no need for docking facilities.

Given the requirement for a larger vault and more infrastructure, including an internal rail line, the footprint and duration of construction and associated vehicular movements will be greater for RC storage than the other technical options and thus there is greater potential to cause direct damage/loss or negatively affect the setting and amenity of above ground historical or archaeological features within the development footprint or within the local vicinity. It is expected that both RC and RPV storage options will require a large-scale crane to move RCs/RPVs within the facility which will further increase the potential of negatively affecting visual amenity/setting of cultural features compared to the Packaged Waste storage option.

An increased need for invasive construction techniques to construct the RC storage facility will increase the potential for direct loss or damage to subsurface or buried archaeological remains compared to other technical options.

Stage II : Designing and Developing the Interim ILW Storage Facilities

Cultural Heritage

Due to the need to transport RC by sea, the RC storage option would require the construction of a dock which has the potential to negatively affect seabed archaeological sites or remains. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised).

Proposed Mitigation / Enhancements Measures:

Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities on a greenfield site).

Summary: Option 1 has been assessed as having a potentially negative impact on this objective. The construction activities have the potential to negatively impact archaeological features both on site and within the vicinity, either by direct loss or damage or by affecting the settings and amenity. Subsurface or buried archaeological remains may be affected by contamination, ground consolidation, or changes to the hydrological regime during construction. There is also a potential for pollution from engine exhausts generated through increased traffic to negatively impact on features. The risk of a negative impact is greater for RC storage than the other technical options due to the increased construction activity associated with a a larger facility and need for dredging to construct a dock of sufficient depth to accommodate RCs (which could negatively affect seabed archaeology sites/remains).	**-**

Option 2: Develop a Brownfield Site for ILW Storage

Assessment of Effects:

Although the overall scale of construction is considered to be less for Option 2 than Option 1 (as the majority of ancillary infrastructure will be in place) each of the effects mentioned above for greenfield (including visual effects to above ground archaeological features and loss/damage to both above ground and buried/submerged archaeological features) have the potential to have a negative impact depending on the presence of historic features on site or in the surrounding area. However, as the site has been previously developed, it is assumed that these previous activities will have affected subsurface or buried archaeological remains, if present and as such, their cultural significance will be considerable diminished. Conversely, the brownfield site could potentially include listed buildings within the development footprint that could be affected by the construction activities.

The brownfield site may also be located close to other listed buildings within adjacent sites or buried/seabed archaeological remains, which could also be affected by the construction activities. The significance of any adverse effects will be exacerbated if these structures, features or remains are designated.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well as reception, admin, dispatching, inspection and maintenance areas. Security facilities including a security centre and standoff area will also be required as well as an internal rail line. However, it is assumed that docking facilities, car parking and roads will already be present.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and docking facilities (should RPV's be transported by sea) will already be present.
- Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and external rail line (if required) will already be present. As packaged waste is likely to be transported by either road or rail it is assumed that there will be no need for docking facilities.

Given the requirement for a larger vault and more infrastructure, including an internal rail line, the footprint and duration of construction and associated vehicular movements will be greater for RC storage than the other technical options and thus there is greater potential to cause

Stage II : Designing and Developing the Interim ILW Storage Facilities Cultural Heritage	
direct damage/loss or negatively affect the setting and amenity of above ground historical or archaeological features within the development footprint or within the local vicinity. It is expected that both RC and RPV storage options will require a large-scale crane to move RCs/RPVs within the facility which will further increase the potential of negatively affecting visual amenity/setting of cultural features compared to the Packaged Waste storage option. An increased need for invasive construction techniques to construct the RC storage facility will increase the potential for direct loss or damage to subsurface or buried archaeological remains compared to other technical options. Due to the need to transport RC by sea, the RC storage option may require dredging which could negatively affect seabed archaeological sites or remains. Similar effects may also be generated under the RPV storage option should RPVs be transported by sea (which is the most likely mode of transport to be utilised). **Proposed Mitigation / Enhancements Measures:** Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).	
Summary: Option 2 has been assessed as having a potentially negative impact on this objective as construction activities have the potential to negatively impact listed buildings on site and other archaeological features found in adjacent sites, either by direct loss or damage or by affecting the settings and amenity. Subsurface or buried archaeological remains may be affected by contamination or ground consolidation during construction. There is also a potential for pollution from engine exhausts generated through increased traffic to negatively impact on features. Although the scale of construction will be less than for Option 1, the same uncertainties remain associated to the site and location of archaeological features, therefore, the potential remains for a negative effect. The risk of a negative impact is greater for RC storage than the other technical options due to the increased construction activity associated with a larger facility and need for dredging (which could negatively affect seabed archaeology sites/remains).	**-**
Option 3: Develop a Licensed/Authorised Site for ILW Storage	
Assessment of Effects: Although the overall scale of construction is considered to be less for Option 3 than the other options (as the majority of ancillary infrastructure will be in place) each of the effects mentioned above for greenfield and brownfield (including visual effects to above ground archaeological features and loss/damage to both above ground and buried/submerged archaeological features) have the potential to have a negative impact depending on the presence of historic features on site or in the surrounding area. However, as the site has been previously developed, it is assumed that these previous activities will have affected subsurface or buried archaeological remains, if present and as such, their cultural significance will be considerable diminished. An existing Licensed/Authorised site could potentially include listed buildings within the development footprint, other listed buildings within adjacent sites or buried/seabed archaeological remains. The significance of any adverse effects will be exacerbated if these structures, features or remains are designated. Given that necessary infrastructure, such as docks required for RC storage, should already be in place, it is considered that the extent of dredging required will be minimal. **Technical Options:** • RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well reception, admin, dispatching, inspection and maintenance areas. It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present. • RPV storage will require a facility with an area in the region of 801m^2 (including total vault area and reception, admin, dispatching,	

Stage II : Designing and Developing the Interim ILW Storage Facilities Cultural Heritage	
inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present. • Packaged ILW storage will require a facility with an area in the region of 1,004.6m^2 (including total vault area as well as reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as security (standoff and centre), car parking, roads and external rail line (if required) are assumed to be already present. As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar. However, as the docks are expected to already be in use at existing Licensed/Authorised sites it is anticipated that the level of dredging required and potential negative effects for both RC and RPV storage options may be less than for brownfield sites. **Proposed Mitigation / Enhancements Measures:** Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).	
Summary: Option 3 has been assessed as having a potentially negative impact on this objective as construction activities have the potential to negatively impact listed buildings on site and other archaeological features found in adjacent sites, either by direct loss or damage or by affecting the settings and amenity. Subsurface or buried archaeological remains may be affected by contamination or ground consolidation; however, as part of an existing development, it is likely that any subsurface or buried archaeological remains will have been disturbed already and their cultural value substantial diminished. Although the scale of construction will be less than for Option 1, the same uncertainties remain associated to the site and location of archaeological features, therefore, the potential remains for a negative effect. The risk of a negative impact is greater for RC storage than the other technical options due to the increased construction activity associated with a larger facility and potential need for dredging (which could negatively affect seabed archaeology sites/remains).	**-**

Stage III: Dock Submarines and Process the Reactor Compartments

Cultural Heritage

Option 1: Dock Submarine & Cut-Out Reactor Compartment

Assessment of Effects:

Should additional large scale plant equipment to that already installed during construction, such as craneage or cradles be required to support RC removal, this could potentially undermine the setting and value of above ground archaeological features, such as listed buildings, both within the development footprint of the site and within the local vicinity. The severity of any such effect is dependent on the equipment itself (including its height, location within the site and the duration of use) as well as the circumstances of the location surrounding the site (such as historical context and location/proximity of existing archaeological features). However, it is assumed that such equipment would only be required on a temporary basis primarily during the initial dismantling of the RC and, therefore, the effects would not be significant. Full processing of the RC, which is to be undertaken once the proposed GDF becomes available and post interim storage, may also require additional plant equipment although it again assumed that the use of such equipment would be temporary. Furthermore, docking and mooring may also contribute to this effect, although this is dependent on the location of the site.

Although separating the RC from the rest of the submarine would generate dust, it is assumed that precautions would be taken to minimise this at source, such as environmental containments techniques, so that overall releases would be comparable to existing refitting activities.

There is potential for pollution from engine exhausts and vibration associated with any increase in rail or road traffic (especially HGVs for transportation of plant equipment and waste to and from the site during dismantling) to have a negative effect on historical or archaeological features (e.g. listed buildings). However, this is unlikely to be on a scale great enough to cause significant impact in the medium term.

In addition, submarine movement could impact on any underwater archaeology, seabed wrecks or submarine artefacts through submarine sinking from a collision event, submarine grounding or a major fire event. Although, if these events were to occur the impact on environmental receptors could be negative, the likelihood of any occurring is very small. iI is considered that any such risk is remote as submarines will have undergone preparation for safe transportation.

It is assumed that during dismantling and processing activities, safeguards would be in place to prevent any accidental radioactive or non-radioactive discharges from reaching any environmental receptors (including subsurface remains). As a result, for all options it is considered unlikely that there will be any significant impact from accidental discharges. However, if these safeguards were to fail there is potential for a significant negative effect on subsurface or buried remains. The significance of such an event would depend upon the location and proximity to archaeological features/remains.

The SDP would dispose of the UK's current and past submarine fleet. There is an opportunity to preserve a submarine or artefacts from them as pieces of nationally-important cultural and military heritage.

Proposed Mitigation / Enhancements Measures:

- Filtration techniques, such as High Efficiency Particulate Air (HEPA) filtration, should be used to minimise release of dusts and aerosols produced during cutting operations.
- Consider alternative cutting techniques to minimise generation of dust and aerosols, for example, plasma arc techniques generate substantial amounts of dust and aerosols, in comparison to mechanical alternatives.
- Any risk of causing nuisance dust arising from dismantling activities should be reduced by making use of Best Available Technology and selecting suitable energy efficient, low emission equipment. This may include the following measures to suppress dust: the use of wet sweeping and cleaning methods; use of vehicle wheel wash facilities; the enforcement of low speed limits along temporary roads; paving of haul routes on site even if temporary to prevent re-suspension of dust emissions; sheeting vehicles transporting loose or potentially dusty material; delivering fine powder materials in enclosed tankers/silos; storage of dusty materials away from site boundaries.
- Zoning of dismantling site so that increased dust is kept to a minimum.
- In considering the layout of the dismantling facility, early consideration should be given to the likely location and type of temporary plant equipment that will be required in order to identify those locations where the introduction of new visual elements could have a negative effect on visual amenity of above ground archaeological features and enable appropriate mitigation measures to be designed and implemented to have maximum impact in terms of reducing any negative effects.
- Negative effects from the introduction of large scale plant equipment may be reduced by the use of appropriate siting and screening (e.g. –

Stage III: Dock Submarines and Process the Reactor Compartments Cultural Heritage	
through the use of existing woodlands or copses, planting or through consideration of topography). • Temporary plant equipment that may have a negative effect on visual amenity should not be retained on site for longer than is necessary to support operational activities.	
Summary: Option 1 has been assessed as having the potential for minor negative effects on this objective. HGV movements required to transport waste and plant equipment to and from the dismantling site and the need for the temporary use of large scale equipment particularly related to the movement of RC's. As fewer processing activities will occur under Option 1 prior to interim storage, large scale plant equipment will be required for a shorter duration and the risk of negative effects from this on the objective may be considered less for Option 1 than the other options. Risks of accidental discharge during the removal of RC are considered to be low, however, if such an event were to occur this could have a negative effect on this objective, depending on location and proximity to archaeological features. Although it is expected that some dust will be generated during RC initial dismantling, filtration techniques and environmental containment should prevent negative effects on this objective.	**0/-**
Option 2: Dock Submarine & Cut-Out Reactor Pressure Vessel	
Assessment of Effects: Under option 2, plant equipment used under option 1 may be required for longer duration. Depending on the method of removal adopted (whether removal from the top or side of the hull), RPV initial dismantling may also require heavy lifting cranes which could significantly affect the setting of above ground archaeological features depending upon the equipment itself (including its height, location within the site and the duration of use) as well as the circumstances of the location surrounding the site (such as historical context and location/proximity of existing archaeological features). It is assumed that precautions would be taken to minimise any emissions at source, such as environmental containment techniques, so that overall releases would be comparable to refitting activities. There is potential for pollution from engine exhausts and vibration associated with any increase in rail or road traffic (especially HGVs in the case of road traffic), for movement of plant machinery and waste to and from the site, to have a negative effect on historical or archaeological features (e.g. listed buildings). In the medium term there would be additional HGV movement compared to Option 1, related to the transportation of LLW to the National LLW Repository. However, this is unlikely to be on a scale great enough to cause significant impact. The significance of any such effects would depend upon the location, proximity and sensitivity of any archaeological features/remains. In addition, submarine movement could impact on any underwater archaeology, seabed wrecks or submarine artefacts through submarine sinking from a collision event, submarine grounding or a major fire event. Although, if these events were to occur the impact on environmental receptors could be negative, the likelihood of any occurring is very small. It is considered that any such risk is remote as submarines will have undergone preparation for safe transportation. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 2 has been assessed as having a potentially negative impact on this objective. As there will be more processing activities and waste generated prior to interim storage compared to Option 1 the number of HGV movements required to transport waste and plant equipment to and from the dismantling facility is likely to increase and the large scale equipment are likely to be required for longer periods. As a result the risk of negative effects from this on the objective is considered to be	**0/-**

Stage III: Dock Submarines and Process the Reactor Compartments Cultural Heritage	
greater for Option 2 than Option 1. Risks of accidental discharges are considered to be low, however, if such an event were to occur this could have a potentially negative effect on this objective, depending on location and proximity to archaeological features. Although it is expected that some dust will be generated during RPV initial dismantling, environmental containment techniques should prevent negative effects on this objective.	
Option 3: Dock Submarine & Cut-up Packaged Waste	
Assessment of Effects: It is expected that under Option 3, plant equipment, such as heavy lifting cranes, used under option 2 may be required. Similarly to Option 2 the presence of this equipment may significantly affect the setting of above ground archaeological features depending upon the equipment itself (including its height, location within the site and the duration of use) as well as the circumstances of the location surrounding the site (such as historical context and location/proximity of existing archaeological features). It is assumed that precautions would be taken to minimise any emissions at source, such as environmental containment techniques, so that overall releases would be comparable to refitting activities. There is potential for pollution from engine exhausts and vibration associated with any increase in rail or road traffic (especially HGVs in the case of road traffic), for movement of plant machinery and waste to and from the site, to have a negative effect on historical or archaeological features (e.g. listed buildings). In the medium term there would be additional HGV movement compared to Option 1 and 2, related to RPV initial dismantling, processing of packaged waste and transportation of LLW. However, this is unlikely to be on a scale great enough to cause significant impact. The significance of any such effects would depend upon the location, proximity and sensitivity of any archaeological features/remains. In addition, submarine movement could impact on any underwater archaeology, seabed wrecks or submarine artefacts through submarine sinking from a collision event, submarine grounding or a major fire event. Although, if these events were to occur the impact on environmental receptors would likely be significantly negative, the likelihood of any occurring is very small. However, it is considered that any such risk is remote as submarines will have undergone preparation for safe transportation. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1	
Summary: Option 3 has been assessed as having a potentially negative impact on this objective. As there will be more processing activities (related to RPV initial dismantling, size reduction and processing of packaged waste) and waste generated prior to interim storage compared to Option 2, the number of HGV movements required to transport waste and plant equipment to and from the dismantling facility is likely to increase and the large scale equipment are likely to be required for longer periods. As a result the risk of negative effects from this on the objective is considered to be greater for Option 2 than Option 1. Risks of accidental discharges are considered to be low, however, if such an event were to occur this could have a potentially negative effect on this objective, depending on location and proximity to archaeological features. Although it is expected that some dust will be generated during dismantling, filtration techniques and environmental containment should prevent negative effects on this objective.	**0/-**

Stage IV: Dismantling and Recycling the Residual Submarine Hulls and Processing Wastes

Cultural Heritage

All Options

Assessment of Effects:

It is expected that activities associated with dismantling and recycling of submarines at the dismantling facility should not require any additional large scale plant equipment to that already used during processing (i.e. – stage 3). Furthermore, all large scale plant equipment should already be in use and located at the ship recycling facility. As a result, the use of large scale plant equipment in recycling the submarines should not have any effect on setting or visual amenity of above ground archaeological features, such as listed buildings that may be located within or in close proximity to either sites.

Although it is expected that operations would generate dust at both the dismantling site and ship-recycling site, it is assumed that precautions would be taken to minimise this at source, such as filtration techniques, so that overall releases would be minimal.

HGV movements associated with the movement of plant equipment, wastes, or recycled materials to and from both the dismantling facility and the ship-recycling facility have the potential to have a negative effect on cultural heritage structures and sites adjoining the transport networks via increases in noise, vibration or emissions. It is considered that works occurring at the ship-recycling facility will be of a similar nature already occurring on site such as it is not expected for there to be considerable increases the number of HGV movements or a significant change to the baseline situation. There may also be an opportunity to transport these materials by sea to prevent against increasing HGV movements.

There is a risk for accidental discharge of potential contaminants (including fuel, oil and any remaining hazardous material) during the movement of submarines from the dismantling facility to the ship-recycling facility which could have a negative effect on subsurface, buried or underwater remains. However, it is considered that any such risk is remote as the submarines will have undergone preparation for safe transportation, including watertight integrity.

It is assumed that during preparation and recycling activities, safeguards would be in place to prevent any accidental radioactive or non-radioactive discharges from reaching subsurface remains. As a result it is considered unlikely that there will be any significant impact from accidental discharges. However, if these safeguards were to fail there is potential for a negative effect on surface or buried heritage assets. The significance of such an event would depend upon the location and proximity to archaeological features/remains.

During the recycling of the submarine there will be the opportunity to recover and preserve artefacts from the submarine which could be displayed as pieces of nationally important cultural and military heritage in, for example, a museum, having a positive effect on public access to cultural heritage.

Proposed Mitigation / Enhancements Measures:

- Filtration techniques, such as High Efficiency Particulate Air (HEPA) filtration, should be used to minimise release of dusts and aerosols produced during cutting operations
- Any risk of causing nuisance dust arising from operational activities should be reduced by making use of Best Available Technology and selecting suitable energy efficient, low emission equipment.
- Zoning of dismantling site so that increased dust is kept to a minimum
- Temporary plant equipment that may have a negative effect on visual amenity should not be retained on site for longer than is necessary to support operational activities.

Summary:	**0/+?**
This option has been assessed as having a neutral impact on this objective. The use of large scale equipment is unlikely to affect visual amenity or setting of above ground archaeological features, as the equipment will already be in use for stage 3 in the case of dismantling facility or in existing activities as the ship recycling facility. Although it is expected that some dust will be generated during operational activities, environmental containment should prevent	

Stage IV: Dismantling and Recycling the Residual Submarine Hulls and Processing Wastes Cultural Heritage	
negative effects on this objective. Risks of accidental discharges during transportation of submarines or operations are considered to be low, however, if such an event were to occur this could have a potentially negative effect on this objective, depending on location and proximity to archaeological features. The movement of wastes and recycled materials from dismantling and ship-recycling sites via HGVs are considered to be of a similar scale already experienced in ship-recycling activities. Therefore, the risk of negatively affecting above ground archaeological features is considered to be low. The opportunity to preserve and display artefacts recovered from the submarine during the recycling process would have a positive effect on this objective.	

Stage V: Transport RC/RPV/ILW to Interim Storage Cultural Heritage	
Option 1: Reactor Compartment Transport and Storage	
Assessment of Effects: It is assumed that RC casings would be transported by sea. This could impact on any underwater archaeology or seabed wrecks if the RC sank or was grounded, or a major fire event and these receptors were directly affected. However, the likelihood of any event occurring is exceptionally small. There is a risk for accidental discharge of potential contaminants (including fuel, oil and any remaining hazardous material) during the movement of RC which could have a negative effect on subsurface, buried or underwater remains. However, it is considered that any such risk is exceptionally remote as the hulls will have undergone preparation for safe transportation, including watertight integrity. This stage of the SDP process will not require the construction of new buildings or infrastructure at either the dismantling facility or storage facility and it is assumed that any large scale equipment (e.g. cranes required to load/unload RCs) would be developed during Stages 1 and 2. Consequently, it is envisaged that the type of effects on the visual amenity of above ground archaeological features at or within close vicinity to either the dismantling or storage site will be similar to those identified under Stages 3 and 4. The potential for any radiological and non radiological discharges from the storage of the RC is considered exceptionally low given the containment of all potentially hazardous material within the sealed compartment (which itself is stored within a closed structure). There is the potential for radiological discharges and non radiological discharges from an unplanned incident (such as a fire or explosion at the interim storage facility). However, it is assumed that safeguards would be in place to prevent any such release. If these safeguards were to fail and the discharges were to reach environmental receptors then there could be a negative impact on cultural heritage assets. **Proposed Mitigation / Enhancements Measures:** • Negative effects from the introduction of large scale plant equipment may be reduced by the use of appropriate siting and screening (e.g. – through the use of existing woodlands or copses, planting or through consideration of topography). • Temporary plant equipment that may have a negative effect on visual amenity should not be retained on site for longer than is necessary to support operational activities.	
Summary: Option 1 has been assessed as having a neutral impact on this objective. Although large scale equipment may be needed for the initial movement of RC's when they are received at the storage site, this will be only for a short period of time and unlikely to affect visual amenity of above ground archaeological features. Although, if accidental discharges were to occur during transportation or storage, they are both extremely unlikely to affect subsurface/seabed/buried archaeological remains.	**0**
Option 2: Reactor Pressure Vessel Transport and Storage	
Assessment of Effects: The RPV could be transported from the dismantling facility to the interim storage facility either by sea, rail or road. Currently a transportation container for the RPV is yet to be developed and its exact nature is yet to be determined; however, as it will have to meet the same standards for containment of any radiological discharge and Option 1, it is considered that the potential for discharges during transportation by sea are the same as Option 1. If transportation by rail is chosen, it is assumed that the RPV (and its container pack) would be taken to a rail freight handling site and loaded directly onto a rail bogey. The initial movement from the dismantling facility to the rail freight handling facility would be via a heavy lift HGV. The RPV would then be transported to the interim storage facility. At this stage, it is unknown whether the interim storage facility would have a rail head. Given that the frequency of movement of the RPV would be one per annum, it is not considered that there would be any adverse effects on cultural heritage associated with its movement.	

Stage V: Transport RC/RPV/ILW to Interim Storage Cultural Heritage	
The sealing and packaging of a vessel to store RPV will be designed to minimise the possibility of any radiological discharge from a breach to the container during transport and interim storage. The potential for any radiological and non radiological discharges from the storage of the RPV is considered exceptionally low given the containment of all potentially hazardous material within the sealed compartment (which itself is stored within a closed structure). There is the potential for radiological discharges and non radiological discharges from an unplanned incident (such as a fire or explosion at the interim storage facility). However, it is assumed that safeguards would be in place to prevent any such release. If these safeguards were to fail and the discharges were to reach environmental receptors then there could be a negative impact on cultural heritage. **Proposed Mitigation / Enhancements Measures:** • No additional measures to Option 1 proposed.	
Summary: Option 2 has been assessed as having a neutral impact on this objective. Movement by road is an option, but since only one HGV movement is expected per annum this is considered as unlikely to increase pollution and vibration to a level that will put above ground archaeological features at risk. Accidental discharges during transportation and interim storage are both considered as very unlikely and discharges are also highly unlikely to affect subsurface/seabed/buried archaeological remains.	**0**
Option 3: Packaged Waste Transport and Storage	
Assessment of Effects: All packaged waste arising from the facility will comprise of size reduced components of the RPV, all will be solid, predominately comprise of steels and grouted into a container box for transport. It is assumed that there will be no liquid ILW to be moved as PW. Packaged waste could be transported from the dismantling facility to the interim storage facility by either rail or road. It is assumed that regulator approved $3m^3$container will be used for the packaged waste, irrespective of the mode of transport required. It is estimated that between 4 and 8 containers will be required for the packaged ILW arising from the dismantling of each submarine. An over-pack will also be required for the container during transportation, which although it has not been developed yet, is a common requirement across the nuclear industry to ensure safe and secure transportation of packaged waste. It is estimated that the average weight of the $3m^3$container and over-pack will exceed normal HGV loads and so special vehicles and permissions maybe required to facilitate the necessary movements between initial dismantling facility and store, if the ILW were top be moved by road. As a high end estimate, it is assumed that each container of packaged waste is moved separately by either road or rail, which would necessitate up to 8 separate movements per annum. In terms of journey frequency and any associated disruption on adjacent sensitive receptors, this frequency would not be considered to pose any effect to cultural heritage, under normal operating circumstances. There is the potential for an accidental release arsing from a traffic accident in either mode. However, the likelihood of this is exceptional small, particularly for any movement of packaged waste by rail. In terms of road, rail, sea or air movements, in 2009, there were half a million movements of packaged radioactive waste. There were 32 incidents or accidents recorded. None of these led to any significant radiation doses being received by sensitive receptors (including biota). The potential for any radiological and non radiological discharges from the storage of the packaged waste is considered exceptionally low, given the containment of all potentially hazardous material within the sealed container (which itself is stored within a closed structure). There is the potential for radiological discharges and non radiological discharges from an unplanned incident (such as a fire or explosion at the interim storage facility). However, it is assumed that safeguards would be in place to prevent any such release. If these safeguards were to fail and the discharges were to reach environmental receptors then there could be a negative impact on cultural heritage.	

Stage V: Transport RC/RPV/ILW to Interim Storage Cultural Heritage	
Proposed Mitigation / Enhancements Measures: No additional measures to Option 1 proposed.	
Summary: Option 3 has been assessed as having a neutral impact on this objective. Movement by road is most likely, but given the scale of HGV movements required this option is considered as unlikely to increase pollution and vibration to a level that will put above ground archaeological features at risk. Accidental discharges during transportation and interim storage are both considered as very unlikely and discharges are also highly unlikely to affect subsurface/seabed/buried archaeological remains.	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to Proposed GDF

Cultural Heritage

Option 1: Reactor Compartment Segregation and Size Reduction, PW Transfer to Proposed GDF

Assessment of Effects:

Depending on the location of the dismantling facility for removal of the RPV from the RC, and the size reduction facility for the packaging of ILW vis-à-vis the interim storage facility, there may be a requirement to transport RC's prior to processing, it is expected due to the size and weight of RC that this will only occur by sea and by barge. This could impact on any underwater archaeology or seabed wrecks if the RC sank or was grounded, or a major fire event and these receptors were directly affected. However, the likelihood of any event occurring is exceptionally small. There is a risk for accidental discharge of potential contaminants (including fuel, oil and any remaining hazardous material) during the movement of RC which could have a significant effect on subsurface, buried or underwater remains. However, it is considered that any such risk is remote as the hulls will have undergone preparation for safe transportation, including watertight integrity.

Depending on the method adopted, initial RPV removal from the RC may require additional heavy lifting craneage which could significantly affect the setting and value of above ground cultural features (such as listed buildings and SAMs) depending upon the equipment itself (including its height, location within the site and the duration of use) as well as the circumstances of the location surrounding the site (such as historical context and location/proximity of existing archaeological features). However, it is assumed that such equipment would only be required on a temporary basis (i.e. primarily during the physical removal of the RPVs) and, therefore, the effects would not be significant. It is assumed that subsequent RPV processing and ILW packaging would be undertaken inside a size reduction facility building and would therefore not require any additional external equipment.

It is assumed that precautions would be taken to minimise any emissions at source, such as environmental containment techniques, so that overall releases would be comparable to refitting activities.

There is potential for pollution from engine exhausts and vibration associated with HGV movements required for the transportation of plant equipment and waste (including LLW and packaged waste) to and from the size reduction facility to have a negative effect on historical or archaeological features (e.g. listed buildings). However, this is unlikely to be of sufficient scale to cause significant impact. There may also be an opportunity to transport these materials by sea which would serve to offset increases in HGV movements.

Recycling activities will be undertaken on site post removal of the RPV and will also generate vibration and emissions associated with the use of equipment (e.g. hot cutting) and HGV movements required to transport waste and recyclates from the site. However, as the works would be of a similar nature to those already undertaken on site, it is assumed that there would be no significant change to the existing baseline.

During dismantling, processing and recycling activities, safeguards would be in place to prevent any accidental radioactive or non-radioactive discharges from reaching any environmental receptors (including subsurface remains). As a result, for all options it is considered unlikely that there will be any significant impact from accidental discharges. However, if these safeguards were to fail there is potential for a negative effect on surface or buried cultural heritage assets. The significance of such an event would depend upon the location and proximity to archaeological features/remains.

Proposed Mitigation / Enhancements Measures:

- Filtration techniques, such as High Efficiency Particulate Air (HEPA) filtration, should be used to minimise release of dusts and aerosols produced during cutting operations.
- Consider alternative cutting techniques to minimise generation of dust and aerosols, for example, plasma arc techniques generate substantial amounts of dust and aerosols, in comparison to mechanical alternatives.
- Any risk of causing nuisance dust arising from dismantling activities should be reduced by making use of Best Available Technology and selecting suitable energy efficient, low emission equipment.
- Zoning of the size reduction facility so that increased dust is kept to a minimum.
- In considering the layout of the size reduction facility, early consideration should be given to the likely location and type of temporary plant equipment that will be required in order to identify those locations where the introduction of new visual elements could have a negative effect on visual amenity of above ground archaeological features and enable appropriate mitigation measures to be designed and implemented to have maximum impact in terms of reducing any negative effects.
- Negative effects from the introduction of large scale plant equipment may be reduced by the use of appropriate siting and screening (e.g. –

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to Proposed GDF

Cultural Heritage

through the use of existing woodlands or copses, planting or through consideration of topography).

- Temporary plant equipment that may have a negative effect on visual amenity should not be retained on site for longer than is necessary to support operational activities.

Summary:	
Option 1 has been assessed as having a potentially negative impact on this objective. This primarily reflects the potential requirement for additional heavy lifting craneage which could affect the setting and value of above ground archaeological features. However, it is assumed that such equipment would only be required on a temporary basis and, therefore, the effects would not be significant. It is assumed that subsequent RPV processing and packaging would be undertaken inside a size reduction facility building and would therefore not require any additional external equipment. Although it is expected that some dust will be generated during operational activity, filtration techniques and environmental containment should prevent negative effects on this objective. Pollution and emissions from HGV movements could have a negative effect on historical or archaeological features (e.g. listed buildings) although the frequency of movements is low and, consequently, any adverse effects are unlikely to be significant. Risks of accidental discharges are considered to be low, however, if such an event were to occur this could have a potentially negative effect on this objective, depending on location and proximity to archaeological features.	**0/-**

Option 2: Reactor Pressure Vessel Segregation and Size Reduction, PW Transfer to Proposed GDF

Assessment of Effects:

RPV dismantling and ILW packaging would be undertaken inside a size reduction facility building as RPV removal will have been carried out during Stage 3. Consequently, it is considered unlikely that there would be any significant effects on the setting and value of above ground archaeological features associated with the use of additional equipment during this phase of the works. It is also expected that any emissions would be primarily contained within the size reduction facility.

There remains potential for pollution from engine exhausts and vibration associated with HGV movements required for the transportation of plant equipment and waste (including LLW and packaged waste) to and from the site during dismantling to have a negative effect on historical or archaeological features (e.g. listed buildings). However, the number of HGV movements related to operational activity under this option is likely to be small and lower than for Option 1 as volumes of waste arisings (both LLW and non-radioactive) would be reduced (as significant size and weight reductions of the RPV will have been undertaken during Stage 3). Consequently, it is likely that the potential for adverse impacts on cultural heritage assets would also be reduced. There is potential for RPVs to be transported by road or rail from the interim storage facility to the size reduction facility which would require the use of a wide/abnormal load vehicle and security escort generating additional emissions and vibration, although it is expected that any effects would only be temporary and infrequent (as only a single RPV would transported per year) and, consequently, are unlikely to be significant.

The risk of accidental radioactive or non-radioactive discharges associated with operational activities may be viewed as being less than for Option 1. This reflects the fact that RPV removal would not be required with all activities being undertaken inside a size reduction facility which is expected to contain any discharges. Notwithstanding this, if the safeguards were to fail there is potential for a negative effect on surface or buried cultural heritage assets. The significance of such an event would depend upon the location and proximity to archaeological features/remains.

Proposed Mitigation / Enhancements Measures:

- No additional mitigation measures proposed above those set out for Option 1.

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to Proposed GDF Cultural Heritage	
Summary: RPV dismantling and packaging would be undertaken inside a size reduction facility building and therefore it is considered unlikely that there would be any significant effects on the setting and value of above ground archaeological features associated with the use of additional equipment. Pollution and emissions from HGV movements could have a negative effect on historical or archaeological features (e.g. listed buildings) although the frequency of movements is low and, consequently, any adverse effects are unlikely. Risks of accidental discharges are considered to be low, however, if such an event were to occur this could have a potentially negative effect on this objective, depending on location and proximity to archaeological features.	**0**
Option 3: Transport Packaged Waste to Proposed GDF	
Assessment of Effects: Under Option 3 all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process) and consequently, effects on this objective will relate to the transportation of packaged waste to the proposed GDF only. These effects are expected to be similar to those associated with the transportation of packaged waste identified under Options 1 and 2. There is the potential for packaged waste to be transported at a higher frequency than 8 separate movements per annum (subject to the number of over packs available and proposed GDF availability to receive packaged waste) as under this option no further processing prior to transportation to the proposed GDF would be required. As a high end estimate, if all packaged waste was to be moved over a period of 1 year with the existing number of overpacks (2), transport movements would occur approximately 4 times per week. However, taking into account the fact that there would be no (or very few) standard HGV movements associated with this option, this is unlikely to be of sufficient scale to significantly impact historical or archaeological features (e.g. listed buildings) although it is recognised that the severity of any adverse effects is dependent on a number of factors including whether packaged waste is transported by road or rail, the routing of movements and the proximity of sensitive receptors. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1	
Summary: Option 3 has been assessed as having a neutral effect on this objective as the all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process) and scale of vehicle movement for the transportation of packaged ILW to the proposed GDF is unlikely to be of a sufficient scale to negatively affect this objective. Risks of accidental discharges are considered to be low, however, if such an event were to occur this could have a potentially negative effect on this objective, depending on location and proximity to archaeological features.	**0**

Stage VII: Decommissioning the SDP Facilities

Cultural Heritage

Option 1: Decommission Greenfield Sites

Assessment of Effects:

Decommissioning activities, such as demolition, could result in damage to visible above ground cultural heritage or archaeological features within the development footprint of the surface site area. These activities may also have a negative effect on the setting and amenity of above ground historic or archaeological features and landscapes (e.g. world heritage sites, conservation areas, listed buildings, scheduled monuments and registered parks and gardens) within the vicinity.

Due to the increased scale of decommissioning activities required to remove all buildings, infrastructure and hardstanding in order to restore the site to its previous greenfield condition, it is assumed that increased volumes of general waste will be produced. This could increase the number of vehicle movements needed to transport the waste off-site for disposal (depending on the transport mode chosen). There would also be an increase in the number of vehicle movements required to move staff and equipment during the longer decommissioning period. This would be in addition to the vehicle movements associated with movement of ILW to the proposed GDF and LLW to a repository site, which are expected to remain the same across each of the land use options. The overall increase in number of vehicle movements compared to other options could increase the potential for pollution from engine exhausts and vibration to have a negative effect on historic or archaeological features (e.g. – listed buildings) in areas adjoining transport networks during the decommissioning activities.

Once the decommissioning activities are complete all buildings, infrastructures and large scale equipment (e.g. – cranes) used during site operation or decommissioning will be removed including those which may have had a negative visual impact on above ground cultural heritage features within sites or on the setting or amenity of above ground historic features and landscapes within the vicinity. There is the also the opportunity to further enhance setting and amenity of historic features and landscape through landscape design.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste storage options and, on a greenfield site, removal of docking facilities alongside other infrastructure would also be required. Therefore, it is expected that the duration and scale of decommissioning will be greater and that there would be greater potential to cause direct damage/loss or negatively affect the setting and amenity of above ground historical or archaeological features within the development footprint or within the local vicinity.

Proposed Mitigation / Enhancements Measures:

- It is anticipated that any significant detrimental effects arising from demolition on cultural heritage and archaeology, including subsurface and buried archaeology and traditional activities may be minimised through early liaison with, and adhering to guidance issued by English Heritage, LPA and other appropriate organisations.
- In addition to the assessment of effects on archaeological and built heritage features, the effect on historic landscapes should also be considered. This should include characterisation of the landscape and effects on any contribution that the heritage resource may make to tourism in the area.
- Further mitigation might include alterations to the decommissioning methodology (e.g. contaminated soil excavation methods) in order to minimise effects or the retention of historic or archaeological features in situ. The potential for contamination can be minimised by following best practice pollution prevention methods.
- If during development any features were taken into storage they should be reintroduced to the site following the completion of all decommissioning activities.
- Identifying appropriate routes to access the site would help to minimise potential negative effects on historic or archaeological features (e.g.

Stage VII: Decommissioning the SDP Facilities Cultural Heritage	
listed buildings) caused by transport pollution and vibration.	
Summary: Option 1 has been assessed as having a long term positive effect on this objective as in the long term sites will be restored to their previous greenfield condition and all buildings, infrastructure and large scale equipment used during operation or decommissioning which may have had a negative effect on this objective will be removed. There is also the potential to enhance the setting and amenity of historical features through landscape design. Any negative effects on cultural heritage during decommissioning activities are expected to be within the short to medium term and outweighed by the long term effects from restoration on site. However, Option 1 is considered to have a greater potential to negatively affect this objective as there will be a greater scale of decommissioning needed to return sites to their original greenfield condition, although these effects are still considered to be small and short term compared to effects from restoration. The scale of decommissioning associated with the interim storage facility is expected to be greater for RC Storage than RPV and Packaged Waste storage options given the need to remove a larger storage facility and more infrastructure. Due to the anticipated need to remove docking facilities for RPV storage it is expected the RPV storage will have greater effects on this objective compared to Packaged Waste storage which does not require docking facilities. However, this is very unlikely to be on a scale that will alter the significance of effects on this objective.	**-/+**
Option 2: Decommission Brownfield Sites	
Assessment of Effects: The overall scale of demolition is considered to be less for Option 2 than Option 1 as the majority of ancillary infrastructure will remain in place. However, each of the effects identified for greenfield site (including loss or damage to archaeological features through pollution, vibration, contamination, or dust generation) still have the potential to have a negative impact depending on presence of historic features on site or in the surrounding area. Within brownfield sites the above ground archaeological features most likely to be affected include any listed buildings within the development footprint of the surface site area. Furthermore, decommissioning activities may also have a negative effect on the setting and amenity of above ground historic or archaeological features and landscapes. Once the decommissioning activities are complete, all buildings and infrastructure added to the original brownfield site and large scale equipment used during the site's operation or decommission will be removed including those which may have had a negative visual impact on above ground cultural heritage features within the site or on the setting or amenity of above ground historic features and landscapes within the vicinity. There is also the opportunity to further enhance setting and amenity of historic features and landscape through landscape design. **Technical Options:** All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment. RC storage will require decommissioning of a relatively large interim storage facility compared to RPV and Packaged Waste storage options. Therefore, it is expected that the duration and scale of decommissioning will be greater and that there would be greater potential to cause direct damage/loss or negatively affect the setting and amenity of above ground historical or archaeological features within the development footprint or within the local vicinity.	

Stage VII: Decommissioning the SDP Facilities

Cultural Heritage

Proposed Mitigation / Enhancements Measures:

- No additional measures beyond those proposed for Option 1.

Assumptions and Uncertainties:

Assumptions and uncertainties are considered to be the same as for Option 1, with the following exceptions;

- It has been assumed that SDP sites will be in a suburban or semi developed setting.
- It has been assumed for the purposes of this assessment that brownfield sites will have a lower biodiversity interest than a greenfield site, although there are instances where a brownfield site can be important for conservation and biodiversity
- The sites will be restored to their previous brownfield condition. As the majority of ancillary infrastructure would have been present previously, such as roads, rail head and docking facilities it is expected that these will not be removed/demolished under Option 2.

Summary: Option 2 has been assessed as having a long term positive effect on this objective as in sites will be restored to their previous brownfield condition and all buildings, infrastructure and large scale equipment used during the operation or decommissioning which may have had a negative effect on this objective will be removed. The negative short term effects on cultural heritage during decommissioning activities are expected to be minimal compared to the long term effects from restoration on site. Option 2 is considered to have less potential to negatively affect this objective than Option VII.1 as there will be a decreased scale of decommissioning needed to return sites to their original brownfield condition (including the need to remove less infrastructure and fewer restoration activities). The scale of decommissioning associated with the interim storage facility is expected to be greater for RC Storage than RPV and Packaged Waste storage options. However, this is very unlikely to be on a scale that will alter the significance of effects on this objective.	**-/+**

Option 3: Decommission Licensed/Authorised Sites

Assessment of Effects:

The range of potential effects on cultural heritage related to decommissioning activities for Option 3 are expected to be similar to those detailed under Options 1 and 2. However, the overall scale of demolition is considered to be less for Option 3 than Option 1, as the majority of ancillary infrastructure will remain in place.

Within Licensed/Authorised sites the above ground archaeological features most likely to be affected potentially include listed buildings within the development footprint of the surface site area. Furthermore, decommissioning activities may also have a negative effect on the setting and amenity of above ground historic or archaeological features and landscapes.

Once the decommissioning activities are complete all buildings and infrastructure added to the original site and large scale equipment used during operation or decommissioning will be removed including those which may have had a negative visual impact on above ground cultural heritage features within the site or on the setting or amenity of above ground historic features and landscapes within the vicinity.

Technical Options:

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence of the technical options on their severity is also expected to be similar.

Proposed Mitigation / Enhancements Measures:

- No additional measures beyond those proposed for Option 1.

Stage VII: Decommissioning the SDP Facilities Cultural Heritage	
Assumptions and Uncertainties: Assumptions and uncertainties are considered to be the same as for option 2, with the following exceptions; • It has been assumed that SDP facilities will be in a predominantly urbanised setting. • Given that all/most of the infrastructure and hardstanding required for SDP sites will not be required to be removed (as they were present prior to development) the scale and duration of demolition will be less than for Options 1 and 2.	
Summary: Option 3 has been assessed as having a long term positive effect on this objective as in the long term SDP sites will be restored to their previous condition. The negative short term effects on cultural heritage during decommissioning activities are expected to be minimal compared to the long term effects from restoration on site. Option 3 is considered to have less potential to negatively affect this objective than Option 2 as there will be a decreased scale of decommissioning needed to return License/Authorised sites to their original condition (including the need to remove less infrastructure and fewer restoration activities). The scale of decommissioning associated with the interim storage facility is expected to be greater for RC option than the RPV and the Packaged Waste options. However, this is very unlikely to be on a scale that will alter the significance of effects on this objective.	**-/+**

13.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the cultural heritage objective. **Box 13.2** provides a summary of the options that have been assessed.

Box 13.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 13.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score			Commentary
	1D	1R	1B	
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features.	-	0	0/-	**Potential Effects** There is the potential for SDP activities, in particular modifications to existing buildings and the construction of new facilities within the Devonport and Rosyth dockyards to directly impact on designated heritage assets within the dockyards (e.g. direct damage to, modification of or loss of listed buildings in the dockyards or indirect impacts on listed buildings from vibration and dust associated with the use of machinery/plant and ground disturbing activities). However, it is assumed that designated heritage assets within the dockyards would remain intact and would not be modified for use for SDP activities. Therefore the potential for impacts on designated heritage assets within the dockyards is considered to be minor. However, should SDP activities result in damage to, or loss of designated sites, the effects would be significant *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There are no designated archaeological sites in the Devonport of Rosyth dockyards or immediate surrounding areas. There could be the potential for construction activities (e.g. any topsoil stripping, site levelling, digging foundations, piling works, drilling and excavations) to impact on unknown buried archaeological features and remains; however as the dockyards comprise reclaimed land the likelihood of archaeological remains to be present is considered to be very low. There is the potential for SDP activities, in particular construction activities that result in the introduction of new features and elements into the landscape, to impact on the setting and amenity of cultural heritage features and assets in the area surrounding the dockyards, particularly the introduction of tall elements such as dockside cranes and the interim storage area for the RC *(refer to impacts specific to the Devonport and Rosyth dockyards)*.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	-	0	0/-	Modifications to existing facilities and the construction of new facilities may indirectly impact on cultural heritage through the supply chain, for example through sourcing mineral, aggregates or timber resources. It is unknown at this stage where materials would be sourced and therefore the potential for impacts cannot be determined. There is the potential for pollution from vehicle exhausts and vibration associated with road or rail traffic to and from the Devonport and Rosyth dockyards to impact on cultural heritage assets adjoining transport routes (e.g. erosion and weathering). However, no significant impacts are anticipated taking account of estimated transport movements and their nature. Depending on submarine transport methods (whether submarines would be towed into the dockyard, floated onto a heavy lift vessel, or a combination of towing and heavy lift vessel used), there is also the potential for impacts on unknown seabed archaeology *(refer to impacts specific to the Devonport and Rosyth dockyards).* The SDP would dispose of the UK's current and past submarine fleet. There is an opportunity to preserve a submarine or artefacts from them as pieces of nationally-important cultural and military heritage. Of the technical options, as the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2, any impact on cultural heritage during construction could be greater. However, in the case of the RC option, construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation and size reduction would not take place until the interim storage period is nearing completion. This would mean that construction would be spread over two phases rather than one period. Separating activities into two phases could help to keep levels of disturbance below threshold levels where they may become harmful to heritage assets. Devonport Dockyard There are 5 scheduled monuments in the Devonport dockyard (4 in South Yard and 1 in Bull Point). In addition, there are 85 listed buildings, predominantly in South Yard and Bull Point. At this stage it is unknown where SDP facilities would be located within the Devonport dockyard. However, it is assumed that, given the protection afforded to these heritage assets, that the scheduled monuments and listed buildings within the dockyard would not be

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				demolished or inappropriately altered. There is the potential for SDP activities to indirectly impact on these assets (e.g. noise and vibration, and emissions from traffic and plant), although given the scale of development required and the activities undertaken, no significant impacts on heritage assets are anticipated. There is the potential for development within Devonport dockyard to impact on the setting of heritage assets in the dockyard and the surrounding area (e.g. impact on landscape character and views from heritage assets). In addition to the listed buildings and scheduled monuments in the dockyard, Devonport Conservation Area and Devonport Registered Park and Garden are located immediately south of Devonport dockyard, and the Grade II* Antony Registered Park and Garden is located approx. 1.1km to the west/north-west of the dockyard across the Hamoaze Estuary (the eastern end of the Registered Park and Garden fronts on to the west bank of the estuary across the channel from Devonport dockyard with the Grade I listed Antony House situated on a high point in the western part of the park). Adjacent to the Devonport Conservation Area is the Stonehouse Peninsula Conservation Area. There are also several scheduled monuments in the wider surrounding area and the Rame Head and South Devon Heritage Coasts are 5km and 9.5km south and south-east of the site respectively. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, no significant adverse impacts on setting are anticipated. Although the Hamoaze Estuary is not a designated archaeological site there is the potential for dredging required to accommodate heavy lift operations to impact on unknown seabed archaeology. However, it is expected that viable alternatives will be implemented ahead of heavy lift (e.g. wet tow) such that dredging is unlikely to be required. Moreover, as maintenance dredging of the estuary channel by Devonport dockyard is routinely undertaken, the potential for an impact on seabed archaeology is considered to be low.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	-	0	0/-	There are two scheduled monuments located in Plymouth Sound to the south-east of Devonport dockyard; the Coastal Fortifications of Drake's Island and Plymouth Sound Breakwater Fort. Although these scheduled monuments are located in the channel the potential for the transport of submarines to and from Devonport dockyard and to the commercial ship recycling facility to impact on these assets could only occur in the highly unlikely situation of a collision. Rosyth Dockyard There are 2 listed buildings within Rosyth dockyard (the Grade B listed power station and pumping station), both of which are located in the nuclear licensed site within the dockyard. In addition, there are several other listed buildings in the wider dockyard. At this stage it is unknown where SDP facilities would be located within the Rosyth dockyard. However, it is assumed that, given the protection afforded to these heritage assets, that the listed buildings within the dockyard would not be demolished or inappropriately altered. There is the potential for SDP activities to indirectly impact on these listed buildings (e.g. noise and vibration, and emissions from traffic and plant), although given the scale of development required and the activities undertaken, no significant impacts are anticipated. There could be the potential for construction activities within Rosyth dockyard to impact on unknown buried archaeological features and remains. However, previous investigations undertaken to inform the development of the land to the east of Rosyth dockyard (which is also reclaimed land) conclude that given the depth of the made ground incorporated into the port facility over the former foreshore, there is very limited potential for the survival of such features. There is the potential for development within Rosyth dockyard to impact on the setting of listed buildings within the dockyard and heritage assets in the surrounding area. In addition to the listed buildings within the dockyard, there are several listed buildings and two Conservation Areas (Pattiesmuir and Inverkeithing) in the surrounding area and Rosyth Castle scheduled monument is located to the east of the dockyard. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, no significant adverse impacts on setting are anticipated. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				therefore conduct of a heavy lift operation (f required) should be possible. Submarine transportation to and from the Rosyth dockyard is therefore not anticipated to impact on any seabed archaeology. There are no cultural heritage assets within the channel of the Forth that could be impacted upon by submarine transportation. **<u>Comparison of the Options</u>** There is the potential for impacts on heritage assets and their settings at both the Devonport and Rosyth dockyards. However, there is greater potential for impacts on heritage assets at the Devonport dockyard when compared to the Rosyth dockyard, due to the higher concentration of heritage assets both within the dockyard and the locality. In addition, to accommodate heavy lift operations at Devonport dockyard, channel modification and dredging would be required, with the potential for impacts on unknown seabed archaeology. However, it is expected that viable alternatives will be implemented ahead of heavy lift (e.g. wet tow) such that dredging is unlikely to be required. Moreover, as maintenance dredging of the estuary channel by Devonport dockyard is routinely undertaken, the potential for an impact on seabed archaeology is considered to be very low. In the case of Rosyth dockyard, no channel modification or dredging would be required. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster dismantling of submarines, reducing the timescale of any potential impacts on cultural heritage associated with SDP activities.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features.	0/-	0	0/-	<u>**Potential Effects**</u> There is the potential for SDP activities, in particular modifications to existing buildings and the construction of new facilities within the Devonport and Rosyth dockyards to directly impact on designated heritage assets within the dockyards (e.g. direct damage to, modification of or loss of listed buildings in the dockyards or indirect impacts on listed buildings from vibration and dust associated with the use of machinery/plant and ground disturbing activities). However, it is assumed that designated heritage assets within the dockyards would remain intact and would not be modified for use for SDP activities. Therefore the potential for impacts on designated heritage assets within the dockyards is considered to be minor. However, should SDP activities result in damage to, or loss of designated sites, the effects would be significant *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There are no designated archaeological sites in the Devonport of Rosyth dockyards or immediate surrounding areas. There could be the potential for construction activities (e.g. any topsoil stripping, site levelling, digging foundations, piling works, drilling and excavations) to impact on unknown buried archaeological features and remains; however as the dockyards comprise reclaimed land the likelihood of archaeological remains to be present is considered to be very low. There is the potential for SDP activities, in particular construction activities that result in the introduction of new features and elements into the landscape, to impact on the setting and amenity of cultural heritage features and assets in the area surrounding the dockyards, particularly the introduction of tall elements such as dockside cranes and the interim storage area for the RPV *(refer to impacts specific to the Devonport and Rosyth dockyards)*. Movement of the submarines to and from the dockyards will be via towing. No dredging is anticipated. Modifications to existing facilities and the construction of new facilities may indirectly impact on cultural heritage through the supply chain, for example through sourcing mineral, aggregates or timber resources. It is unknown at this stage where materials would be sourced and therefore the potential for impacts cannot be determined. There is the potential for pollution from vehicle exhausts and vibration associated with road or rail traffic to and from the Devonport and Rosyth dockyards to impact on cultural heritage assets adjoining transport routes (e.g. erosion and weathering). However, no significant impacts are anticipated taking account of estimated transport movements and their nature.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	0/-	0	0/-	The SDP would dispose of the UK's current and past submarine fleet. There is an opportunity to preserve a submarine or artefacts from them as pieces of nationally-important cultural and military heritage. Of the technical options, the scale of development required for the RPV option would be less than the other technical options, with the RPV option requiring a new interim storage area with a footprint of 801m^2. The RPV option could therefore have the least impact on cultural heritage during construction when compared to the other technical options. In addition, in the case of the RPV option, construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for segregation and size reduction of the RPV would not take place until the interim storage period is nearing completion. Separating activities into two phases could help to keep levels of disturbance below threshold levels where they may become harmful to heritage assets. <u>Devonport Dockyard</u> There are 5 scheduled monuments in the Devonport dockyard (4 in South Yard and 1 in Bull Point). In addition, there are 85 listed buildings, predominantly in South Yard and Bull Point. At this stage it is unknown where SDP facilities would be located within the Devonport dockyard. However, it is assumed that, given the protection afforded to these heritage assets, that the scheduled monuments and listed buildings within the dockyard would not be demolished or inappropriately altered. There is the potential for SDP activities to indirectly

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				impact on these assets (e.g. noise and vibration, and emissions from traffic and plant), although given the scale of development required and the activities undertaken, no significant impacts on heritage assets are anticipated. There is the potential for development within Devonport dockyard to impact on the setting of heritage assets in the dockyard and the surrounding area (e.g. impact on the landscape character and views from heritage assets. In addition to the listed buildings and scheduled monuments in the dockyard, Devonport Conservation Area and Devonport Registered Park and Garden are located immediately south of Devonport dockyard, and the Grade II* Antony Registered Park and Garden is located approx. 1.1km to the west/north-west of the dockyard across the Hamoaze Estuary (the eastern end of the Registered Park and Garden fronts on to the west bank of the estuary across the channel from Devonport dockyard with the Grade I listed Antony House situated on a high point in the western part of the park). Adjacent to the Devonport Conservation Area is the Stonehouse Peninsula Conservation Area. There are also several scheduled monuments in the wider surrounding area and the Rame Head and South Devon Heritage Coasts are 5km and 9.5km south and south-east of the site respectively. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, no significant adverse impacts on setting are anticipated. There are two scheduled monuments located in Plymouth Sound to the south-east of Devonport dockyard; the Coastal Fortifications of Drake's Island and Plymouth Sound Breakwater Fort. Although these scheduled monuments are located in the channel the potential for the transport of submarines to and from Devonport dockyard and to the commercial ship recycling facility to impact on these assets could only occur in the highly unlikely situation of a collision.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	0/-	0	0/-	<u>Rosyth Dockyard</u> There are 2 listed buildings within Rosyth dockyard (the Grade B listed power station and pumping station), both of which are located in the nuclear licensed site within the dockyard. In addition, there are several other listed buildings in the wider dockyard. At this stage it is unknown where SDP facilities would be located within the Rosyth dockyard. However, it is assumed that, given the protection afforded to these heritage assets, that the listed buildings within the dockyard would not be demolished or inappropriately altered. There is the potential for SDP activities to indirectly impact on these listed buildings (e.g. noise and vibration, and emissions from traffic and plant), although given the scale of development required and the activities undertaken, no significant impacts are anticipated. There is the potential for development within Rosyth dockyard to impact on the setting of listed buildings within the dockyard and heritage assets in the surrounding area. In addition to the listed buildings within the dockyard, there are several listed buildings and two Conservation Areas (Pattiesmuir and Inverkeithing) in the surrounding area and Rosyth Castle scheduled monument is located to the east of the dockyard. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, no significant adverse impacts on setting are anticipated. **<u>Comparison of the Options</u>** There is the potential for impacts on heritage assets and their settings at both the Devonport and Rosyth dockyards. However, there is greater potential for impacts on heritage assets at the Devonport dockyard when compared to the Rosyth dockyard, due to the higher concentration of heritage assets both within the dockyard and the locality. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites would enable faster dismantling of submarines, reducing the timescale of any potential impacts on cultural heritage associated with SDP activities.

Options 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features.	-/?	-/?	-/?	**Potential Effects** There is the potential for dismantling activities, in particular modifications to existing buildings and the construction of new facilities within the Devonport and Rosyth dockyards to directly impact on designated heritage assets within the dockyards (e.g. direct damage to, modification of or loss of listed buildings in the dockyards or indirect impacts on listed buildings from vibration and dust associated with the use of machinery/plant and ground disturbing activities). However, it is assumed that designated heritage assets within the dockyards would remain intact and would not be modified for use for dismantling activities. Therefore the potential for impacts on designated heritage assets within the dockyards is considered to be minor. However, should dismantling activities result in damage to, or loss of designated sites, the effects would be significant *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There are no designated archaeological sites in the Devonport of Rosyth dockyards or immediate surrounding areas. There could be the potential for construction activities (e.g. any topsoil stripping, site levelling, digging foundations, piling works, drilling and excavations) to impact on unknown buried archaeological features and remains; however as the dockyards comprise reclaimed land the likelihood of archaeological remains to be present is considered to be very low. There is the potential for dismantling activities, in particular construction activities that result in the introduction of new features and elements into the landscape, to impact on the setting and amenity of cultural heritage features and assets in the area surrounding the Devonport and Rosyth dockyards, particularly the introduction of tall elements such as dockside cranes *(refer to impacts specific to the Devonport and Rosyth dockyards)*. In the case of this option, following initial dismantling (RPV removal) the RPV would be transported off the dismantling site to a remote site for interim storage and subsequent segregation/size reduction (full dismantling of the RPV). Depending on the location of the remote site and the facilities that would be available there could be the potential for construction of interim storage and segregation/size reduction facilities, and subsequent interim storage and segregation/size reduction activities to impact upon cultural, historic and/or archaeological sites/features and their settings.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	-/?	-/?	-/?	There could also be the potential for impacts on unknown archaeology and cultural heritage resources, although assuming that the remote site is operational and is likely to predominantly comprise developed land, the potential for significant impacts is considered unlikely. At this stage a remote site has not been identified and consequently the potential effect of interim storage and segregation/size reduction activities on cultural heritage is uncertain. Modifications to existing facilities and the construction of new facilities for SDP activities may indirectly impact on cultural heritage through the supply chain, for example through sourcing mineral, aggregates or timber resources. It is unknown at this stage where materials would be sourced and therefore the potential for impacts cannot be determined at this stage. There is the potential for pollution from vehicle exhausts and vibration associated with road or rail traffic to and from the Devonport and Rosyth dockyards and the remote site to impact on cultural heritage assets adjoining transport routes (e.g. erosion and weathering). However, no significant impacts are anticipated taking account of estimated transport movements and their nature. Movement of the submarines to and from the dockyards will be via towing. No dredging is anticipated. The SDP would dispose of the UK's current and past submarine fleet. There is an opportunity to preserve a submarine or artefacts from them as pieces of nationally-important cultural and military heritage. Of the technical options, the scale of development required for the RPV option would be less than the other technical options, with the RPV option requiring a new interim storage

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				area with a footprint of 801m^2. The RPV option could therefore have the least impact on cultural heritage during construction when compared to the other technical options. In addition, construction would also take place on two different sites, reducing any impacts on cultural heritage from SDP activities as the scale of activity undertaken at the respective sites would be less. In the case of the RPV option construction of SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only (assuming that the existing facilities at the Devonport and Rosyth dockyards are sufficient for processing the LLW arising from dismantling). Construction of facilities for segregation and size reduction of the RPV would not take place until the interim storage period is nearing completion. This would mean that construction would be spread out over two phases rather than one period. Separating activities into two phases could help to keep levels of disturbance below threshold levels where they may become harmful to heritage assets. In the case of this option, construction would also take place on two different sites. Devonport Dockyard There are 5 scheduled monuments in the Devonport dockyard (4 in South Yard and 1 in Bull Point). In addition, there are 85 listed buildings, predominantly in South Yard and Bull Point. At this stage it is unknown where the dismantling facilities would be located within the Devonport dockyard. However, it is assumed that, given the protection afforded to these heritage assets, that the scheduled monuments and listed buildings within the dockyard would not be demolished or inappropriately altered. There is the potential for dismantling activities to indirectly impact on these assets (e.g. noise and vibration, and emissions from traffic and plant), although given the scale of development required and the activities undertaken, no significant impacts on heritage assets are anticipated.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	-/?	-/?	-/?	There is the potential for development within Devonport dockyard to impact on the setting of heritage assets in the dockyard and the surrounding area (e.g. impact on the landscape character and views from heritage assets). In addition to the listed buildings and scheduled monuments in the dockyard, Devonport Conservation Area and Devonport Registered Park and Garden are located immediately south of Devonport dockyard, and the Grade II* Antony Registered Park and Garden is located approx. 1.1km to the west/north-west of the dockyard across the Hamoaze Estuary (the eastern end of the Registered Park and Garden fronts on to the west bank of the estuary across the channel from Devonport dockyard with the Grade I listed Antony House situated on a high point in the western part of the park). Adjacent to the Devonport Conservation Area is the Stonehouse Peninsula Conservation Area. There are also several scheduled monuments in the wider surrounding area and the Rame Head and South Devon Heritage Coasts are 5km and 9.5km south and south-east of the site respectively. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, no significant adverse impacts on setting are anticipated. There are two scheduled monuments located in Plymouth Sound to the south-east of Devonport dockyard; the Coastal Fortifications of Drake's Island and Plymouth Sound Breakwater Fort. Although these scheduled monuments are located in the channel the potential for the transport of submarines to and from Devonport dockyard and to the commercial ship recycling facility to impact on these assets could only occur in the highly unlikely situation of a collision. Rosyth Dockyard There are 2 listed buildings within Rosyth dockyard (the Grade B listed power station and pumping station), both of which are located in the nuclear licensed site within the dockyard. In addition, there are several other listed buildings in the wider dockyard. At this stage it is unknown where dismantling facilities would be located within the Rosyth dockyard. However, it is assumed that, given the protection afforded to these heritage assets, that the listed buildings within the dockyard would not be demolished or inappropriately altered. There is the potential for dismantling activities to indirectly impact on these listed buildings (e.g. noise and vibration, and emissions from traffic and plant), although given the scale of development required and the activities undertaken, no significant impacts are anticipated. There is the potential for development within Rosyth dockyard to impact on the setting of listed buildings within the dockyard and heritage assets in the surrounding area. In addition to the listed buildings within the dockyard, there are several listed buildings and two

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				Conservation Areas (Pattiesmuir and Inverkeithing) in the surrounding area and Rosyth Castle scheduled monument is located to the east of the dockyard. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, no significant adverse impacts on setting are anticipated.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	-/?	-/?	-/?	**<u>Comparison of the Options</u>** The Devonport and Rosyth dockyards are similarly equipped for dismantling, with a similar level of construction/modification required to accommodate dismantling activities. There is the potential for impacts on heritage assets and their settings at both the Devonport and Rosyth dockyards. However, there is greater potential for impacts on heritage assets at the Devonport dockyard when compared to the Rosyth dockyard, due to the higher concentration of heritage assets both within the dockyard and the locality. At this stage a remote site for interim storage has not been identified and subsequently the potential impact of interim storage and segregation/size reduction activities on cultural heritage is uncertain at this stage. The potential for effects would depend on the location of the remote site, the historic and archaeological value of the site and the proximity of the site to cultural, historic and archaeological sites/features. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised for dismantling, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both sites for dismantling would enable faster dismantling of submarines, reducing the timescale of any potential impacts on cultural heritage associated with SDP activities.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

Assessment Criteria	Score			Commentary
	5D	5R	5B	
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features.	0/-	0	0/-	**Potential Effects** There is the potential for SDP activities, in particular modifications to existing buildings and the construction of new facilities within the Devonport and Rosyth dockyards to directly impact on designated heritage assets within the dockyards (e.g. direct damage to, modification of or loss of listed buildings in the dockyards or indirect impacts on listed buildings from vibration and dust associated with the use of machinery/plant and ground disturbing activities). However, it is assumed that designated heritage assets within the dockyards would remain intact and would not be modified for use for SDP activities. Therefore the potential for impacts on designated heritage assets within the dockyards is considered to be minor. However, should SDP activities result in damage to, or loss of designated sites, the effects would be significant *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There are no designated archaeological sites in the Devonport of Rosyth dockyards or immediate surrounding areas. There could be the potential for construction activities (e.g. any topsoil stripping, site levelling, digging foundations, piling works, drilling and excavations) to impact on unknown buried archaeological features and remains; however as the dockyards comprise reclaimed land the likelihood of archaeological remains to be present is considered to be very low. There is the potential for SDP activities, in particular construction activities that result in the introduction of new features and elements into the landscape, to impact on the setting and amenity of cultural heritage features and assets in the area surrounding the dockyards, particularly the introduction of tall elements such as dockside cranes *(refer to impacts specific to the Devonport and Rosyth dockyards)*.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	0/-	0	0/-	Modifications to existing facilities and the construction of new facilities may indirectly impact on cultural heritage through the supply chain, for example through sourcing mineral, aggregates or timber resources. It is unknown at this stage where materials would be sourced and therefore the potential for impacts cannot be determined. There is the potential for pollution from vehicle exhausts and vibration associated with road or rail traffic to and from the Devonport and Rosyth dockyards to impact on cultural heritage assets adjoining transport routes (e.g. erosion and weathering). However, no significant impacts are anticipated taking account of estimated transport movements and their nature. Movement of the submarines to and from the dockyards will be via towing. No dredging is anticipated. The SDP would dispose of the UK's current and past submarine fleet. There is an opportunity to preserve a submarine or artefacts from them as pieces of nationally-important cultural and military heritage. Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. The potential impact on cultural heritage during construction for the PW option could therefore be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full segregation and size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. There could therefore be a greater potential for impacts on cultural heritage from SDP activities as levels of activity and disturbance would be greater. Devonport Dockyard There are 5 scheduled monuments in the Devonport dockyard (4 in South Yard and 1 in Bull Point). In addition, there are 85 listed buildings, predominantly in South Yard and Bull Point. At this stage it is unknown where SDP facilities would be located within the Devonport dockyard. However, it is assumed that, given the protection afforded to these heritage assets, that the scheduled monuments and listed buildings within the dockyard would not be

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				demolished or inappropriately altered. There is the potential for SDP activities to indirectly impact on these assets (e.g. noise and vibration, and emissions from traffic and plant), although given the scale of development required and the activities undertaken, no significant impacts on heritage assets are anticipated. There is the potential for development within Devonport dockyard to impact on the setting of heritage assets in the dockyard and the surrounding area (e.g. impacts on landscape character and views from heritage assets). In addition to the listed buildings and scheduled monuments in the dockyard, Devonport Conservation Area and Devonport Registered Park and Garden are located immediately south of Devonport dockyard, and the Grade II* Antony Registered Park and Garden is located approx. 1.1km to the west/north-west of the dockyard across the Hamoaze Estuary (the eastern end of the Registered Park and Garden fronts on to the west bank of the estuary across the channel from Devonport dockyard with the Grade I listed Antony House situated on a high point in the western part of the park). Adjacent to the Devonport Conservation Area is the Stonehouse Peninsula Conservation Area. There are also several scheduled monuments in the wider surrounding area and the Rame Head and South Devon Heritage Coasts are 5km and 9.5km south and south-east of the site respectively. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, no significant adverse impacts on setting are anticipated.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	0/-	0	0/-	There are two scheduled monuments located in Plymouth Sound to the south-east of Devonport dockyard; the Coastal Fortifications of Drake's Island and Plymouth Sound Breakwater Fort. Although these scheduled monuments are located in the channel the potential for the transport of submarines to and from Devonport dockyard and to the commercial ship recycling facility to impact on these assets could only occur in the highly unlikely situation of a collision. Rosyth Dockyard There are 2 listed buildings within Rosyth dockyard (the Grade B listed power station and pumping station), both of which are located in the nuclear licensed site within the dockyard. In addition, there are several other listed buildings in the wider dockyard. At this stage it is unknown where SDP facilities would be located within the Rosyth dockyard. However, it is assumed that, given the protection afforded to these heritage assets, that the listed buildings within the dockyard would not be demolished or inappropriately altered. There is the potential for SDP activities to indirectly impact on these listed buildings (e.g. noise and vibration, and emissions from traffic and plant), although given the scale of development required and the activities undertaken, no significant impacts are anticipated. There is the potential for development within Rosyth dockyard to impact on the setting of listed buildings within the dockyard and heritage assets in the surrounding area. In addition to the listed buildings within the dockyard, there are several listed buildings and two Conservation Areas (Pattiesmuir and Inverkeithing) in the surrounding area and Rosyth Castle scheduled monument is located to the east. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, no significant adverse impacts on setting are anticipated. **Comparison of the Options** There is the potential for impacts on heritage assets and their settings at both the Devonport and Rosyth dockyards. However, there is a greater potential for impacts on heritage assets at the Devonport dockyard when compared to the Rosyth dockyard, due to the higher concentration of heritage assets both within the dockyard and the locality. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage.

Options 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features.	0/-/?	0/?	0/-/?	**Potential Effects** There is the potential for SDP activities, in particular modifications to existing buildings and the construction of new facilities within the Devonport and Rosyth dockyards to directly impact on designated heritage assets within the dockyards (e.g. direct damage to, modification of or loss of listed buildings in the dockyards or indirect impacts on listed buildings from vibration and dust associated with the use of machinery/plant and ground disturbing activities). However, it is assumed that designated heritage assets within the dockyards would remain intact and would not be modified for use for SDP activities. Therefore the potential for impacts on designated heritage assets within the dockyards is considered to be minor. However, should SDP activities result in damage to, or loss of designated sites, the effects would be significant *(refer to impacts specific to the Devonport and Rosyth dockyards)*. There are no designated archaeological sites in the Devonport of Rosyth dockyards or immediate surrounding areas. There could be the potential for construction activities (e.g. any topsoil stripping, site levelling, digging foundations, piling works, drilling and excavations) to impact on unknown buried archaeological features and remains; however as the dockyards comprise previously reclaimed land the likelihood of archaeological remains to be present is considered to be very low. There is the potential for SDP activities at the Devonport and Rosyth dockyards, in particular construction activities that result in the introduction of new features and elements into the landscape, to impact on the setting and amenity of cultural heritage features and assets in the area surrounding the Devonport and Rosyth dockyards, particularly the introduction of tall elements such as dockside cranes *(refer to impacts specific to the Devonport and Rosyth dockyards)*. In the case of this option, following full segregation and size reduction of the RPVs the LLW would be transported off the dismantling site for disposal in the LLWR as appropriate, and the PW (ILW) would be transported off the dismantling site to a remote site for interim storage. Depending on the location of the site and the facilities that would be available there could be the potential for construction of the interim storage area to impact upon cultural, historic and/or archaeological sites/features and their settings. There could also be the potential for impacts on unknown archaeology and cultural heritage resources, although assuming that the remote site is operational and is likely to predominantly comprise developed land, the potential for significant impacts is considered unlikely. At this stage a remote site has not been identified and consequently the potential effect of interim storage activities on cultural heritage is uncertain. Modifications to existing facilities and the construction of new facilities for SDP activities may indirectly impact on cultural heritage through the supply chain, for example through sourcing mineral, aggregates or timber resources. It is unknown at this stage where materials would be sourced and therefore the potential for impacts cannot be determined at this stage. There is the potential for pollution from vehicle exhausts and vibration associated with road or rail traffic to and from the Devonport and Rosyth dockyards and the remote commercial site to impact on cultural heritage assets adjoining transport routes (e.g. erosion and weathering). However, no significant impacts are anticipated taking account of estimated transport movements and their nature. Movement of the submarines to and from the dockyards will be via towing. No dredging is anticipated. The SDP would dispose of the UK's current and past submarine fleet. There is an opportunity to preserve a submarine or artefacts from them as pieces of nationally-important cultural and military heritage.
M. Cultural Heritage Protect and where appropriate	0/-/?	0/?	0/-/?	Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. The potential impact on cultural heritage during construction for the PW option could therefore be greater than the RPV

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*				option but less than the RC option. In the case of the PW option as it involves full early dismantling of the RPV and segregating the ILW and LLW prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV, resulting ina greater level of disturbance than the RC and RPV options which phase construction. Notwithstanding this, undertaking SDP activities in one phase would help to reduce the time period over which impacts would occur. In the case of this option construction would also take place on three different sites, reducing any impacts from SDP activities on cultural heritage as the scale of activity undertaken at the respective sites would be less. Devonport Dockyard There are 5 scheduled monuments in the Devonport dockyard (4 in South Yard and 1 in Bull Point). In addition, there are 85 listed buildings, predominantly in South Yard and Bull Point. At this stage it is unknown where the dismantling facilities would be located within the Devonport dockyard. However, it is assumed that, given the protection afforded to these heritage assets, that the scheduled monuments and listed buildings within the dockyard would not be demolished or inappropriately altered. There is the potential for dismantling activities to indirectly impact on these assets (e.g. noise and vibration, and emissions from traffic and plant), although given the scale of development required and the activities undertaken, no significant impacts on heritage assets are anticipated. There is the potential for development within Devonport dockyard to impact on the setting of heritage assets in the dockyard and the surrounding area (e.g. impact on the landscape character and views from heritage assets). In addition to the listed buildings and scheduled monuments in the dockyard, Devonport Conservation Area and Devonport Registered Park and Garden are located immediately south of Devonport dockyard, and the Grade II* Antony Registered Park and Garden is located approx. 1.1km to the west/north-west of the dockyard across the Hamoaze Estuary (the eastern end of the Registered Park and Garden fronts on to the west bank of the estuary across the channel from Devonport dockyard with the Grade I listed Antony House situated on a high point in the western part of the park). Adjacent to the Devonport Conservation Area is the Stonehouse Peninsula Conservation Area. There are also several scheduled monuments in the wider surrounding area and the Rame Head and South Devon Heritage Coasts are 5km and 9.5km south and south-east of the site respectively. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, no significant adverse impacts on setting are anticipated. There are two scheduled monuments located in Plymouth Sound to the south-east of Devonport dockyard; the Coastal Fortifications of Drake's Island and Plymouth Sound Breakwater Fort. Although these scheduled monuments are located in the channel the potential for the transport of submarines to and from Devonport dockyard and to the commercial ship recycling facility to impact on these assets could only occur in the highly unlikely situation of a collision.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	0/-/?	0/?	0/-/?	Rosyth Dockyard There are 2 listed buildings within Rosyth dockyard (the Grade B listed power station and pumping station), both of which are located in the nuclear licensed site within the dockyard. In addition, there are several other listed buildings in the wider dockyard. At this stage it is unknown where dismantling facilities would be located within the Rosyth dockyard. However, it is assumed that, given the protection afforded to these heritage assets, that the listed buildings within the dockyard would not be demolished or inappropriately altered. There is the potential for dismantling activities to indirectly impact on these listed buildings (e.g. noise and vibration, and emissions from traffic and plant), although given the scale of development required and the activities undertaken, no significant impacts are anticipated. There is the potential for development within Rosyth dockyard to impact on the setting of listed buildings within the dockyard and heritage assets in the surrounding area. In addition to the listed buildings within the dockyard, there are several listed buildings and two Conservation Areas (Pattiesmuir and Inverkeithing) in the surrounding area and Rosyth Castle scheduled monument is located to the east of the dockyard. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, no significant adverse impacts on setting are anticipated. Based on current known information it is understood that the channel arrangements at

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				Comparison of the Options Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. Option 6/8D could therefore potentially have a greater impact on cultural heritage associated with construction activities, although no significant impacts are anticipated. There is the potential for impacts on heritage assets and their settings at both the Devonport and Rosyth dockyards. However, there is a greater potential for impacts on heritage assets at the Devonport dockyard when compared to the Rosyth dockyard, due to the higher concentration of heritage assets both within the dockyard and the locality. There is therefore considered to be a greater potential for adverse impacts with Option 6/8D in relation to this objective. At this stage a remote site for interim storage has not been identified and subsequently the potential impact of interim storage activities on cultural heritage is uncertain at this stage. The potential for effects would depend on the location of the remote site, the historic and archaeological value of the site and the proximity of the site to cultural, historic and archaeological sites/features.
M. Cultural Heritage Protect and where appropriate enhance the historic environment including cultural heritage resources, historic buildings and archaeological features. *(continued)*	0/-/?	0/?	0/-/?	Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage.

A14. Landscape and Townscape

14.1 Introduction

The SEA of the SDP considers the likely generic effects of the seven proposed stages of the SDP for both land use options and technical proposals. Given that these are generic and could occur anywhere, a national context has been considered appropriate. Siting options for initial submarine dismantling and/or interim ILW storage have also been subject to assessment.

The overview of plans and programmes and baseline information contained in this section provides the context for the assessment of potential effects of the SDP proposals on landscape and townscape. Information is presented for both national and sub-regional levels.

Landscape in this context is defined by **The European Landscape Convention** as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'. This definition is stated as covering natural, rural, urban and peri-urban (i.e. the urban-rural fringe) and includes land, inland water and marine areas. For the purposes of this appraisal though, landscape is taken to apply to rural areas and townscape to urban areas. Visual effects are those effects that influence how people see a landscape or townscape, such as the erection of a building.

14.2 Summary of Plans and Programmes

14.2.1 International

The ***European Landscape Convention*** is principally directed at the national level, but emphasises the importance of landscape as a cultural as well as an aesthetic asset. The convention also calls for improved public involvement in landscape matters. The UK became a signatory to the European Landscape Convention in 2006.

14.2.2 National

UK

In the UK, there are numerous Acts governing the protection of the countryside, landscape and natural environment. The ***National Parks and Access to the Countryside Act 1949*** makes provision for National Parks, confer on the Nature Conservancy and local authorities powers for the establishment and maintenance of nature reserves, makes provision for the recording, creation, maintenance and improvement of public paths and for securing access to open country and confers further powers for preserving and enhancing natural beauty.

The ***Countryside and Rights of Way Act 2000*** increased the duty of provision of public access to the countryside and strengthened legislation relating to Sites of Special Scientific Interest (SSSIs). In particular, it requires public bodies to further the conservation and enhancement of SSSIs both in carrying out their operations, and in exercising their decision making functions.

The ***Marine and Coastal Access Act 2009*** seeks to ensure clean healthy, safe, productive and biologically diverse oceans and seas, by putting in place better systems for delivering sustainable development of marine and coastal environment.

Other relevant Acts include:

- The ***1967 Forestry Act (as amended 1999)*** restricts and regulates the felling of trees. The ***1968 Countryside Act*** enlarges the function of the Agency established under the National Parks and Access to the Countryside Act 1949, to confer new powers on local authorities and other bodies for the conservation and enhancement of natural beauty and for the benefit of those resorting to the countryside.
- The ***1986 Agriculture Act (with numerous revisions)*** covers the provision of agricultural services and goods, agricultural marketing compensation to tenants for milk quotas, conservation and farm grants.
- The ***Commons Act 2006***, which protects common land and promotes sustainable farming, public access to the countryside and the interests of wildlife.

The ***MOD Defence Lands Handbook*** contains a number of objectives relevant to landscape, including;

- to promote the objectives of statutory designated areas (NPs and AONBs) wherever possible;
- in respect of landscape designations, reasonable measures should be undertaken to mitigate the impacts of any development proposals on landscape character; and
- management of sites should seek to maintain the character of the landscape by safeguarding and, where practicable, enhancing or developing significant landscape features, such as woodland, dry stone walls or hedges.

England

The need to protect and enhance landscape and townscape character is set out by Government in planning policy. ***Planning Policy Statement 1 (PPS1): Delivering Sustainable Development*** states that policies should take account of the protection of the wider countryside, the impact of development on landscape quality and should seek to enhance as well as protect landscape and townscape character. ***(PPS7): Sustainable Development in Rural Areas*** sets out that policies should have particular regard to any areas that have been statutorily designated for their landscape, value and that areas of landscape outside nationally designated areas can be particularly highly valued locally and can be protected by policies utilising tools such as landscape character assessment.

Planning Policy Guidance 2 (PPG2): Green Belt confirms the protection of Green Belt land and maintains that there should be a presumption against inappropriate development within Green Belts. ***PPG17*** states that well-designed and implemented planning policies for open space, sport and recreation are fundamental to delivering broader Government objectives.

In 2010, Communities and Local Government published a consultation draft PPS ***'Consultation paper on a new Planning Policy Statement: Planning for a Natural and Healthy Environment'***, which when approved will streamline and replace Planning Policy Statement 9: Biodiversity and Geological Conservation, PPG17, PPG20 and PPS7 in so far as it relates to landscape protection, soil and agricultural quality, forestry, coastal access, heritage coast and the undeveloped coast. With regard to landscape, it states that planning permissions granted for major developments in nationally designated areas should be carried out to high environmental standards through the use of conditions where necessary.

The ***Natural Environment and Rural Communities (NERC) Act 2006*** implements key elements of the Government's Rural Strategy published in July 2004. The NERC Act is designed to help achieve a rich and diverse natural environment and thriving rural communities through modernised and simplified arrangements for delivering Government policy. The NERC Act established a new independent body - Natural England - responsible for conserving, enhancing, and managing England's natural environment for the benefit of current and future generations. The Act made amendments to the both the Wildlife and Countryside Act 1981 and the Countryside and Rights of Way Act 2000, which further enhance provisions to biodiversity generally and SSSIs in particular.

Scotland

The ***Countryside (Scotland) Act 1967*** makes provision for the better enjoyment of the Scottish countryside, the establishment of a Countryside Commission for Scotland and for the improvement of recreational and other facilities. The ***National Parks (Scotland) Act 2000*** provides the legislative framework for National Park designations in Scotland.

Scottish Planning Policy (SSP) 2010, a statement of the Scottish Government's policy on nationally important land use planning matters, sets out several broad principles with regard to landscape, including taking a broader approach to landscape and natural heritage, considering the natural and cultural components of the landscape together and promoting opportunities for enhancement or restoration of degraded landscapes, safeguarding the character of the most sensitive landscapes, and considering potential effects on the landscape, including the cumulative effect of incremental changes, when deciding planning applications. SPP requires local authorities to apply the precautionary principle where the impacts of a proposed development on nationally or internationally significant landscape or natural heritage resources are uncertain but there is sound evidence for believing that significant irreversible damage could occur.

Planning Advice Note 60 (PAN60): Planning for Natural Heritage provides advice on how development and the planning system can contribute to the conservation, enhancement, enjoyment and understanding of Scotland's natural environment and encourages developers and planning authorities to be positive and creative in addressing natural heritage issues.

Wales

Planning Policy Wales (2010) sets out several objectives regarding landscape, including promoting the conservation of landscape and biodiversity, ensuring that Wales contributes to meeting international responsibilities and obligations and ensuring that statutorily designated sites are properly protected and managed.

Technical Advice Note 6: Planning for Sustainable Rural Communities (2010) provides practical guidance on the role of the planning system in supporting the delivery of sustainable rural communities. The TAN seeks to protect and enhance Wales' landscapes.

Northern Ireland

PPS8: Open Space, Sport and Recreation (2004) sets out the Department's planning policies for the protection of open space, the provision of new areas of open space in association with residential development and the use of land for sport and outdoor recreation, and advises on the treatment of these issues in development plans. ***PPS21: Sustainable Development in the Countryside (2010)*** sets out planning policies for development in the countryside. The addendum to ***PPS6: Planning, Archaeology and the Built Heritage (2005)*** is underpinned by objectives to recognise the importance of Areas of Townscape Character and ensure that development proposals respect the appearance and qualities of each townscape area and maintain or enhance character.

Shaping Our Future: Regional Development Strategy for Northern Ireland 2025 (2001) contains several policies relating to landscape and townscape, including policies to:

- protect, manage and enhance the resources of woodland and hedgerows as features of environmental and historic significance;
- protect, enhance and encourage appreciation of the Region's landscapes;

- conserve the coast of Northern Ireland; and
- conserve the character of cities, towns and villages.

14.2.3 Sub-regional locations

Plymouth

The ***Regional Strategy for the South West Environment 2004-2014*** sets out a vision of a region where people benefit from an excellent environment now and in the future. The strategy sets out a number of environmental topics and objectives and is supported by the annual document 'The State of the Environment'. Two key aims of the Strategy related to the landscape include: to conserve and enhance the landscape and historic environment assets for everyone to value and enjoy; and to safeguard and manage the elements of the environment that underpin local distinctiveness.

Policy CS18: Plymouth's Green Space of the ***Plymouth Core Strategy (2007)*** sets out criteria and a methodology for how the Council will protect and support a diverse and multi-functional network of green space and waterscape in Plymouth.

The ***Tamar Area of Outstanding Natural Beauty Management Plan 2009-2014*** produced by the Tamar Valley AONB Partnership outlines the management objectives for Tamar AONB, including landscape management, AONB proofing, improving, understanding and awareness, and sustainable management.

Fife

Chapter 4 of the ***Fife Structure Plan 2006-2026*** includes the following policy objectives regarding landscape:

- safeguarding and improving the character and distinctiveness of Fife's landscapes and coastline, including the landscape setting of towns and villages;
- improving and restoring degraded landscapes;
- protecting and enhancing the natural environment including Fife's biodiversity and geological heritage;
- encouraging woodland planting in appropriate locations;
- protecting and enhancing the historic and built environments which give Fife its sense of place; and

- ensuring development positively contributes to Fife's sense of place.

14.3 Overview of the Baseline

14.3.1 National

UK

Statutory sites designated (wholly or partially) for their landscape value include National Parks, AONBs, Country Parks, Registered Historic Parks and Gardens, Historic Gardens and Designed Landscapes, National Scenic Areas (NSAs) and Regional Parks (in Scotland) and World Heritage Sites.[299]

Other important (non-statutory) sites include Areas of Great Landscape Value (AGLV) in Scotland; Heritage Coasts (in England and Wales); and National Trust/National Trust for Scotland properties.

The UK has 15 National Parks [300] and (excluding Scotland) 49 AONBs.[301] Each National Park is administered by its own National Park Authority whose duty it is to conserve and enhance natural beauty, wildlife and cultural heritage; and to promote opportunities for the understanding and enjoyment of the special qualities of National Parks by the public. The Broads Authority in England has a third purpose to protect the interests of navigation[302]. The primary purpose of AONB is to conserve and enhance the natural beauty of the landscape.

The MOD is the third largest landowner in the UK with a diverse estate of some 238,000 hectares (1% of the UK mainland).[303] A proportion of this land (or land over which MOD has access rights for military purposes) is within National Parks (such as Dartmoor, Northumberland and the Brecon Beacons), AONBs or other statutorily or locally-important landscapes and townscapes. MOD maintains a presumption in favour of public access unless there are operational or training requirements, safety or security limits.

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299 JNCC, landscape designations, http://www.jncc.gov.uk/page-1527
300 Association of National Park Authorities, http://www.nationalparks.gov.uk/
301 National Association of AONB, http://www.aonb.org.uk
302 http://www.nationalparks.gov.uk/learningabout/factsandfigures.htm
303 Source MOD Sustainable Development Report and Action Plan 2009: http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/HealthandSafetyPublications/SSDCD/SustainableDevelopmentPolicy/SustainableDevelopmentStrategyReportsAndActionPlans.htm

England

The 'Character of England Landscape, Wildlife and Cultural Features Map' produced in 2005 subdivides England into 159 areas with similar landscape character called National Character Areas (NCA).[304]

There are ten National Parks in England; the most recently designated National Park being the South Downs National Park on 31 March 2010). Together with The Broads (which has similar protection to a National Park) they cover 9.3% of the land area in England.

There are 34 AONBs in England, one of which straddles England and Wales (the Wye Valley AONB). AONBs cover 18% of England and Wales.[305]

Heritage Coasts are areas defined (they are not statutorily designated) for the beauty and undeveloped nature of the coastline. They represent 33% (1,057km) of England's coastline and are managed to conserve their natural beauty and, where appropriate, to improve accessibility for visitors. Most Heritage Coasts are within the boundaries of National Parks or AONBs, although some including Lundy, the Durham Coast, and Flamborough Head stand alone.

A national record of nearly 1450 Registered Historic Parks and Gardens which contribute to the landscape is maintained by English Heritage. It is a non-statutory designation but the designation is a material planning consideration.

There are 17 World Heritage Sites in England, the most recent of these to be recognised as such is the Cornwall and West Devon mining landscape which was encrypted by UNESCO in 2006.[306]

Scotland

Scotland has been assessed as having 365 types of distinctive landscape character which are divided into 52 groupings.[307]

Scotland has 40 National Scenic Areas (NSAs) covering more than one million hectares (12.7 % of Scotland).[308] Other areas designated for their landscape include two National Parks and three Regional Parks together with a number of AGLV.

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[304] http://www.naturalengland.org.uk/ourwork/landscape/englands/character/areas/default.aspx
[305] See http://www.aonb.org.uk/wba/naaonb/naaonbpreview.nsf/Web%20Default%20Frameset?OpenFrameSet&Frame=Main&Src=%2Fwba%2Fnaaonb%2Fnaaonbpreview.nsf%2F%24LU.WebHomePage%2F%24first!OpenDocument%26AutoFramed (accessed 19.10.2009)
[306] http://whc.unesco.org/en/list/
[307] Scottish Natural Heritage , 2002, Natural Heritage Zones: A national assessment of Scotland's landscapes http://www.snh.gov.uk/docs/B464892.pdf

There are five World Heritage Sites in Scotland; St. Kilda, Old and New Towns of Edinburgh, the Frontiers of the Roman Empire, Heart of Neolithic Orkney and New Lanark.

Wales

There are five AONBs in Wales, one of which straddles England and Wales (the Wye Valley AONB).[301] Other areas designated for their landscape include three National Parks covering 20% of Wales (Brecon Beacons, Snowdonia and Pembrokeshire Coast National Park); 495km of Heritage Coast, and 58 landscapes of outstanding/special historic interest.[309]

There are three World Heritage Sites in Wales; Castles and Town Walls of King Edward in Gwynedd, Blaenavon Industrial Landscape and Pontcysyllte Aqueduct & Canal.[306]

The Landscape Map of Wales recognises 49 sub-regional Landscape Character Areas across Wales.[310]

Northern Ireland

Northern Ireland has nine AONBs, in addition to two proposed AONBs[301], however there are no National Parks in Northern Ireland.

The Giant's Causeway and Causeway Coast was declared a World Heritage Site in 1996.[311]

Northern Ireland has been characterised by the Northern Ireland Environment Agency into 130 distinct landscape areas.

14.3.2 Sub-regional locations

Plymouth

There are two AONBs in Plymouth: Tamar Valley AONB; and South Devon AONB.[312] Cornwall AONB is to the west of Plymouth and covers 10 stretches of Cornish coastline, the Camel Estuary and Bodmin Moor. Dartmoor National Park is situated to the North East of Plymouth.[313]

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[308] Scottish Government, 2010, Land Use Strategy, Strategic Environmental Assessment Screening and Scoping Report, http://www.scotland.gov.uk/Resource/Doc/1051/0095735.pdf
[309] ERM, 2009, Sustainability Appraisal of the Wales Waste Strategy: Sustainability Appraisal Report, http://wales.gov.uk/topics/environmentcountryside/epq/waste_recycling/zerowastebackground/appraisals/?lang=en
[310] http://www.landuse.co.uk/portfolio/project.php?id=191
[311] Department of the Environment, 2003. Shared Horizons, http://www.ni-environment.gov.uk/shared_horizons.pdf
[312] South Devon AONB, http://www.southdevonaonb.org.uk/text.asp?PageId=59. and Tamar Valley AONB, http://www.tamarvalley.org.uk/aboutaonb.asp
[313] Plymouth City Council Nature Conservation, http://www.plymouth.gov.uk/homepage/environmentandplanning/natureconservation.htm

22.4% of the Plymouth's land area is covered by environment designations (nine SSSIs, nine Local Nature Reserves and nine Community Woodlands). Public parks cover 5.5% of land within the city.[314]

Features to be sustained and enhanced in Plymouth's landscape character areas include; Historic waterfronts and dockyards surrounding a vast natural harbour; parkland, hilltop planting, tree features, steep wooded slopes, ridges and valleys; skyline of Dartmoor as a backdrop; variety of ecological habitats; and housing estates.

South Devon AONB has dominant views of Plymouth Sound with its commercial and naval shipping and busy waterfronts.

Fife

Fife has no National Scenic Areas.[315]. However, it does have six Areas of Great Landscape Value (AGLV) (covering 70,640ha) and six Regionally Important Geological Sites (RIGs) covering 186ha.[316]

Fife is comprised mainly of open countryside, and the built up area accounts for 11% of total land surface.

Nineteen Landscape Character Areas (LCAs) have been identified in Fife, these areas fall within 5 regional character areas, namely; the volcanic uplands of Midland Valley, Midland Valley lowland, Midland Valley coastal, intertidal and maritime landscapes.[317]

14.4 Existing problems

14.4.1 National

UK

The UK has many important and protected landscapes which may be sensitive to development. The character of the UK's landscapes are broadly being maintained, however 20% show signs of neglect.

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[314] Plymouth City Council, http://www.plymouth.gov.uk/characteristicsplymouth

[315] Scottish Natural Heritage, map of national scenic areas, http://www.snh.org.uk/pdfs/nsa/NSAspecialqualityproject.pdf

[316] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1

[317] Scottish Natural Heritage (1999) Fife landscape character assessment, http://www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=305

The natural environment of the UK is much less 'rich' than 50 years ago and remains under pressure from more intense use of the land and sea; continuing economic development, climate change and increased pressures from public access.

Although it is recognised that some changes in landscape, such as restoration of derelict industrial sites, have led to improvements in the quality of the natural environment, Natural England state that landscape change on the whole is resulting in declining diversity, distinctiveness and ecological richness.[318]

The Scottish landscape is vulnerable to a variety of pressures. Key threats and opportunities to landscape character include the development of new infrastructure, agriculture, the loss and expansion of woodland and natural processes. [319]

Climate change, new roads, other developments, over-fishing and intensive farming methods are combining to present a powerful threat to the Welsh environment and landscapes.[320]

The future of agriculture in Northern Ireland is uncertain and so rural communities wish to diversify, therefore there are increasing pressures to use natural and historic heritage as the basis for economic growth based on recreation and tourism.[321]

14.4.2 Sub-regional locations

Plymouth

Post WWII reconstruction rebuilt Plymouth with a series of local centres and suburban settlements (the Abercrombie Plan). However suburban settlements now form islands of better planned development in a mass of sprawling, amorphous council estates.[322]

Fife

Fife's wetlands appear to be progressively reducing, and there is an acknowledged trend of increasing development pressure on landscapes more generally in the area.

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[318] http://www.naturalengland.org.uk/ourwork/landscape/threats/default.aspx
[319] Scottish Natural Heritage, 2002, Natural Heritage Zones: A National Assessment of Scotland's Landscapes, http://www.snh.gov.uk/docs/B464892.pdf
[320] http://www.wildlifepartnerships.org/aims.htm
[321] http://www.doeni.gov.uk/niea/land-home/landscape_home/designated-areas-2.htm
[322] Plymouth City Council, Plymouth Rapid Urban Characterisation Study 2005, http://www.plymouth.gov.uk/homepage/environmentandplanning/planning/planningpolicy/ldf/ldfbackgroundreports/brrapidurbancharacterisation.htm

14.5 Likely evolution of the baseline

14.5.1 National

UK

Over the last century the following landscape character trends have been experienced: [323]

- a gradual erosion of local distinctiveness in some areas, through a process of standardisation and simplification of some of the components that make up landscape character;
- a loss of some natural and semi-natural features and habitats such as ancient woodlands and unimproved grassland;
- a decline in some traditional agricultural landscape features such as farm ponds and hedgerows, and a loss of archaeological sites and traditional buildings;
- increased urbanisation, often accompanied by poor design standards and a decline in the variety of building materials, and the importation of urban and suburban building styles into rural areas; and
- a loss of remoteness and reduced tranquillity because of built development and traffic growth.

There are a number of pressures and risks outlined in the ***State of the Natural Environment 2008***) that may affect the quality of landscapes in England. These include[324]:

- **Sea-level rise:** Over the next few decades it is anticipated that there will be major sea incursions inland during storms, particularly on the south and east coasts of England. If measures such as managed retreat are not adopted in low-lying areas, there may be widespread losses of intertidal and coastal habitats. In the coastal zone, sea-level rise may also result in the direct loss of freshwater habitats such as reedbeds and wet grasslands;
- **Fire:** More droughts in the future will make the countryside increasingly vulnerable to wildfire, with potential for heathland, grassland, broadleaved woodlands and bogs to undergo major change in their structure;
- **Grazing management:** More summer droughts may mean that grazing is no longer possible in some open habitats such as fens, grasslands and heathlands due to die-back of

[323] Natural England, State of the Natural Environment 2008, Landscape Characterisation and Change, http://www.naturalengland.org.uk/publications/sone/sections.aspx
[324] Natural England (2008) State of the Natural Environment http://www.naturalengland.org.uk/publications/sone/default.aspx

vegetation and a lack of drinking water for animals. The spread of diseases (e.g. bluetongue) related to climate change may also reduce livestock numbers and restrict movement, altering grazing patterns and landscapes;

- **Energy production:** The production of biofuels in the countryside may result in changes to landscapes. Wind energy developments are likely to be more common; and
- **Development pressure:** Within rural England, the area of developed land has increased by about 4% since 1990. It is expected that the pace of development within England will increase in the future to make up for the current shortfall in housing provision. The effect of this increase pressure for development is likely to be felt most acutely in central and southern England, particularly around identified Growth Areas and Growth Points.

England

Natural England report that in 2008 existing landscape character was being maintained in 51% of England's landscapes, whilst in a further 10% existing character was being enhanced. However, 20% of landscapes were showing signs of neglect. [325]

Data from 1990 to 2003 indicates that in England the number of Character Areas with patterns of change that either maintain or enhance character has increased from 36% to 61%. The number of Character Areas with evidence of neglect or erosion of character has decreased. This evidence suggests that the character of the majority of English landscapes, at Character Area scale, is being sustained.

Forestry Commission England seeks to maintain the area of certified woodland and to ensure that 95% of woodland SSSIs are in favourable condition by 2011. [326]

The protected nature of National Park and AONB landscapes make it less likely that these landscapes will be affected by some of the risks outlined (e.g. development pressure) although those protected landscapes nearest to existing urban areas are more likely to be at risk.

Scotland

Forestry Commission Scotland aimed to see Scotland's woodlands increase from 17.1% of land area to about 25% and bring 80% of the special features on Scotland's nationally important nature sites into favourable condition by March 2008.

[325] Natural England, State of the Natural Environment 2008, Landscape Characterisation and Change, http://www.naturalengland.org.uk/publications/sone/sections.aspx
[326] Forestry Commission England, 2008, Delivery Plan 2008-2012: England's Trees, Woods and Forests

Wales

The distinctive character of the Welsh landscape has been, and remains, under threat and is declining. Future changes to the farming subsidy regime have the potential to result in significant changes to the landscape. [327]

Northern Ireland

The main pressures on landscape character in Northern Ireland are development, infrastructure, extraction industries, agriculture, forestry and tourism[328]. The Northern Ireland Forest Service seeks to increase new woodland cover by 550ha by 2010.[329]

14.5.2 Sub-regional locations

Plymouth

No trend data/information for Plymouth was identified. However, Plymouth City Council's Core Strategy includes the target to protect and support a diverse and multi-functional network of green space and waterscape. [330]

Fife

Fife's Wetlands appear to be declining due to changes in habitat distribution and land use (based on Phase I survey data from Fife Council for 1995 and 2003).[331]

There is a trend of increasing development pressure on landscapes. However effects are likely to be minimised by strategic location of developments away from sensitive landscapes.[332]

14.6 Assessment objective, guide questions and significance

The objective and guide questions related to landscape and townscape that have been used in the assessment of the effects of the SDP are set out in Table 14.1, together with reasons for their selection.

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[327] ERM, 2009, Sustainability Appraisal of the Wales Waste Strategy: Sustainability Appraisal Report, http://wales.gov.uk/topics/environmentcountryside/epq/waste_recycling/zerowastebackground/appraisals/?lang=en

[328] Environment and Heritage Service, 2008, Our Environment, Our Heritage, Our Future: State of the Environment Report for Northern Ireland, http://www.ni-environment.gov.uk/index/about-niea/state_of_the_environment/state_of_the_environment_report.htm

[329] Northern Ireland Forest Service, 2010, Annual report 2009-2010, http://www.forestserviceni.gov.uk/index/about-us.htm

[330] Plymouth CC, Core Strategy

[331] Fife Council, State of the Environment Report, 2007, http://fifedirect.org.uk/publications/index.cfm?fuseaction=publication.pop&pubid=1155288E-DA38-0392-2D23E6CA90FF3AD1

[332] Fife Council, Fife Structure Plan 2006 - 2026 Post Adoption SEA 2010, http://www.fifedirect.org.uk/uploadfiles/publications/c64_PostAdoption-FinalisedPostAdoptionSEAStatement-January20101.pdf

Table 14 .1 Approach to assessing the effects of SDP on landscape and townscape

Objective/guide question	Reasoning
Objective: Protect and enhance landscape and townscape quality and visual amenity.	Considering the protection and enhancement of landscape and townscape character is a requirement of PPS1.
Will the SDP Proposals have significant visual impacts (including those at night)?	Visual impacts can influence how people perceive a landscape or townscape and can decrease the character and intrinsic value.
Will the SDP Proposals affect protected/designated landscapes or townscapes, such as National Parks or Conservation Areas?	Areas designated for their landscape value are important at a national level and should be protected from adverse effects and enhanced where possible.
Will the SDP Proposals affect the intrinsic character of local landscapes or townscapes?	Considering the protection and enhancement of landscape and townscape character is a requirement of PPS1.
Will the SDP Proposals affect public access to open spaces or the countryside?	*National Parks and Access to the Countryside Act 1949* and *Countryside and Rights of Way Act 2000* makes provision for National Parks, confer on the Nature Conservancy and local authorities powers for the establishment and maintenance of nature reserves, makes provision for the recording, creation, maintenance and improvement of public paths and for securing access to open country and confers further powers for preserving and enhancing natural beauty. *Countryside and Rights of Way Act 2000* increased the duty of provision of public access to the countryside.

Table 14.2 sets out guidance utilised during the assessment to help determine the relative significance of potential effects on the landscape and townscape objective. It should not be viewed as definitive or prescriptive; merely illustrative of the factors that were considered as part of the assessment process.

Table 14.2 Approach to determining the significance of effects on landscape and townscape

Effect	*Description*	*Illustrative Guidance*
++	Significant positive	• Option would make a significant positive contribution to statutorily-designated landscapes. • Option would have a significant positive effect on the setting and attractiveness of local landscapes and townscapes (e.g. through the replacement of poorly designed/derelict buildings with high quality development). • Option would enhance public access to the countryside and increase open space provision.
+	Positive	• Option would serve to enhance statutorily-designated landscapes. • Option would have a positive effect on the setting and attractiveness of local landscapes and townscapes. • Option would enhance public access to open spaces and the countryside.

Effect	Description	Illustrative Guidance
0	No (neutral effects)	• Option would not have any effects on landscapes or visual amenity. • Option would not enhance or restrict public access to open spaces and the countryside.
-	Negative	• Option would have short-term negative effects on statutorily-designated landscapes. • Option would have a negative effect on the intrinsic character of landscapes and townscapes. • Option would affect the visual amenity of local communities. • Option would temporally restrict public access to open spaces and the countryside.
--	Significant negative	• Option would have long-term negative effects on statutorily-designated landscapes (such as AONBs). • Option would severely affect the intrinsic character of landscapes and townscapes. • Option would severely affect the visual amenity of local communities. • Option would result in the loss of open spaces and restrict public access to the countryside.
?	Uncertain	• From the level of information available the effects the impact that the option would have on this objective is uncertain.

14.7 Generic Assessment of Potential Effects

This section comprises the assessment of the generic stages of the SDP on the landscape and townscape objective. **Table 14.3** provides a brief overview of each of the generic stages that comprise the SDP together with the respective options that have been assessed.

Table 14.3 Summary of SEA Assessments undertaken at each stage of the SDP

Key Stages	The SEA will assess the effects of…
Stage I Design and develop initial submarine dismantling facilities	• Developing initial dismantling facilities on: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to Packaged (ILW) Waste.
Stage II Design and develop the interim ILW storage facilities	• Developing ILW storage facilities on: – undeveloped, 'greenfield' land; – previously developed, 'brownfield' land – 'existing' Licensed/ Authorised site(s). • The infrastructure needed to undertake each technical option: – Store the RC; – Store the RPV; or – Store the Packaged Waste.
Stage III Dock submarines and remove the radioactive materials	• Transporting the submarines. • Undertaking each technical option: – Separating the RC; – Removing the RPV; or – Size reducing the RPV to form Packaged Waste.
Stage IV Dismantle the residual submarine hulls, and process wastes	• Ship recycling, including management and transport of the non-ILW waste streams.
Stage V Transport the RC/ RPV/ ILW to interim Storage	• Transporting the ILW to interim storage (if needed).
Stage VI Size reduce the RC/ RPV (if appropriate); Transfer Packaged Waste to proposed GDF	• Size reducing the RC or RPV (if the ILW was stored in this way). • Transporting the Packaged Waste to the proposed GDF.

Key Stages	The SEA will assess the effects of…
Stage VII Decommission SDP facilities	• Decommissioning the facilities and reinstating the site(s) to their previous land quality: – undeveloped, 'greenfield' land; – previously developed 'brownfield' land; and – 'existing' Licensed/ Authorised site(s).

A range of assumptions have had to be made in completing the generic assessment. The key assumptions used are described in **Table 14.4** below.

Table 14.4 Summary of Key Assumptions for the Generic Assessment of the SDP

Category	Assumption Description
Uncertainties (all stages)	As the ILW storage options identified are not site specific, the characteristics of local communities, flora, fauna and cultural heritage assets cannot be known. As such it has not been possible to determine specific effects on: • designated nature conservation sites or protected species populations; • existing levels of deprivation, the potential of the local area to supply construction workers and, related to this, the number of local employment opportunities to be generated; • health (without an understanding of existing levels of health, the presence of existing health related designations such as Air Quality Management Areas and the location of sensitive receptors); • designated geological conservation sites, important geological features and land stability; • rivers, water bodies and groundwater; • other existing or proposed redevelopment/regeneration programmes; • designated cultural heritage assets and features (and their setting); • landscape and townscapes including, for example, Conservation Areas and Areas of Outstanding Natural Beauty.
Land types, pre development (for Stages I and II)	• **Undeveloped, 'greenfield' site** - It has been assumed that an undeveloped, 'greenfield' site will be in a predominantly rural setting within the open countryside, although it is recognised that such sites may be located in or on the edge of urban areas. In the environs it is assumed that existing water quality and the quality of aquatic environment will be high, there will be no existing land contamination, and that ambient air quality will be good. • **Previously developed, 'brownfield' site** - It has been assumed that a previously-developed, 'brownfield' site will be in an urban or industrial setting, within or adjacent to an existing settlement, although it is recognised that such sites could also be located in the open countryside. It is expected that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It has been assumed for the purposes of this assessment that 'brownfield' sites will have a lower biodiversity interest than 'greenfield' sites, although it is recognised that 'brownfield' land can be important for

Category	Assumption Description
	conservation and biodiversity. • **'Existing', nuclear-Licensed or Authorised sites** - It has been assumed that a nuclear Licensed or Authorised site (including land immediately adjacent to those site boundaries) will be in a predominantly industrial or urban setting and that ambient air quality will be generally good, although there maybe the occasional breach of a statutory target. It is assumed that there will be no unknown archaeological features on an existing site as these would have been discovered previously.
Construction of initial dismantling and storage facilities (Stage I and II)	• Construction is assumed to be of a similar nature to any standard commercial construction project, with similar levels of vehicle movements, noise, vibration, energy use, air emissions, discharges to sewer, numbers of workers, etc.
Size of initial dismantling facility (Stage I)	• All three technical options will ultimately require RC/RPV dismantling, size reduction and packaging of the ILW. Consequently, it is assumed that the footprint of initial dismantling and size reduction facilities will be similar across all generic land use options. It is estimated that the dismantling facility comprising, amongst other elements, the in-dock dismantling facilities (known as the 'Dock Bottom Village'), dockside facilities and size reduction facility would have a total footprint of approximately 17,500m^2. • Additional supporting infrastructure, such as roads, stand off areas and security fencing will also be required if the initial dismantling facility is developed on either a greenfield or brownfield site.
Size of interim storage facility (Stage II)	• **RC storage** will require a facility with an area in the region of 11,600m^2. A dock would be required to receive the RC for transfer to the interim store; depending on the land option this may or may not be already present. • **RPV storage** will require a facility with an area of 801m^2. Should RPVs be transported by sea then docking facilities would also be required; depending on the land option this may or may not be already present. • **Fully-packaged ILW storage** will require a facility with an area of 1,005m^2 . As packaged ILW is likely to be transported by either road or rail, it is assumed that there will be no need for docking facilities.
Duration of the construction phase for SDP facilities (Stages I and II)	• Whilst the exact duration and scale of construction works cannot be determined, it has been assumed that development on an undeveloped, 'greenfield' site would require the construction of more supporting infrastructure and ancillary facilities than the other site types; and would therefore take longer than for the other land use categories. Development of an 'existing' site is assumed to take the shortest amount of time.
Moving the submarines to initial dismantling (Stage III)	• Movement of submarines to the initial dismantling site(s) will be by sea by either a direct ('wet') tow, or a 'dry' tow on the back of a barge, standard cargo vessel or a heavy-lift ship. • One submarine movement per year is expected.
Removing the radioactive materials (Stage III)	• It is assumed that there will be one submarine processed per year. • The initial dismantling programme will produce (depending on the technical option used) either 27 Reactor Compartments, 27 Reactor Pressure Vessels (and associated ILW components), or between 108 and 216 3m^3 boxes of ILW (based on an expectation of between 4 and 8 boxes of ILW per submarine, with 6 as the average). • It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine

Category	Assumption Description
	• It is assumed that during dismantling and processing activities, safeguards would be in place to prevent accidental radioactive or non-radioactive discharges to air. As a result, for all options, it is considered unlikely that there will be any unplanned radiological discharges (interpreted in this report as a maximum credible unplanned release, rather than a maximum possible unplanned release).
Volumes of Radioactive Waste generated (Stage III)	• It is assumed that between 19 and 58 tonnes of ILW will be produced per submarine. • Between 91 and 154 tonnes of LLW is expected to arise per submarine. Of this, up to 95% can be decontaminated and recycled (since most LLW is only surface-contaminated), leaving between 4 and 44 tonnes of LLW per submarine to be disposed of. • If the RC is stored intact, it is assumed that there will be no LLW produced until the RC is dismantled after interim storage. • No significant differences are expected in the volume of ILW or LLW produced across the options (even for RC storage), since the classifications are driven by long-lived radioactive elements such as Ni63.
Number of jobs supported by the SDP	• **Separate and store the intact Reactor Compartment** - 20-30 Full Time Equivalent (FTE) positions are expected to be supported every year during the RC separation, assuming one is processed per year over 27 years. Between 55-100 posts will be supported when the RC is dismantled and the ILW is packaged (Stage 6). • **Remove and store the Reactor Pressure Vessel** - 30-60 FTE positions per year are expected to be supported by RPV removal and storage. Between 25 and 40 jobs will be supported following interim storage, when the RPV is taken apart and packaged for disposal (Stage 6). • **Remove and store fully-packaged ILW** -Packaging the ILW 'up front' is expected to support between 55 and 100 FTE positions per year over the 27 years of initial dismantling. No further opportunities will be generated in the longer term under this option.
Ship recycling	• It has been assumed that remaining submarine hulls will be 'broken' and recycled at an existing commercial ship recycling facility in the UK and not at the initial dismantling site. • Movement of submarines from the initial dismantling facility to the ship recycling facility will be by sea via one of three methods: wet towing; barge/ heavy left vessel; or reconnection of the hulls (if the RC is removed) to produce a watertight unit capable of floating and being towed. • It is considered that the way in which the remaining hulls are 'broken' and recycled will remain broadly the same across the technical options. • It is assumed that using an existing commercial UK ship recycling facility would not require any additional facilities or new recovery processes to be developed at that site, since breaking a cleared submarine is little different to breaking a conventional surface ship.
Transporting the RC, RPV or Packaged ILW to Interim storage (Stage V)	• **RC** –The RC will weigh between approximately 700 and 1,000 tonnes. The sealed RC will serve as the interim storage container and will not require additional shielding. Due to the RC's weight, they could only be moved off-site by sea, using a barge or heavy lift ship. • **RPV** - RPVs weigh between 50 and 80 tonnes and will need suitable containment for transportation and storage to meet transport regulations. It is assumed that RPVs can be transported from the initial dismantling facility to the interim storage facility by sea, rail or

Category	Assumption Description
	road. • **Fully-packaged ILW -** It is assumed that each $3m^3$ container will weigh approximately 5.4 tonnes, and will be transportable by road, rail or sea. This equates to between 108 and 216 containers in total.
Decommissioning of SDP facilities (Stage VII)	• It is assumed that decommissioning the SDP facilities will begin shortly after the final submarine has been sent to a ship recycling facility, the ILW has been transferred to the proposed GDF and there is no further need for the facilities. • There may be some development needed to decommission the facilities (e.g. construction of a waste segregation facility); however this will be very small scale compared to the amount of demolition required, and so it is not assessed. • The demolition is assumed to be of a similar type to any standard commercial demolition site and will finish when the land has been reinstated to a state compatible with its former use. The duration and extent of the work required will be dependent on the original use for the land. Reinstating an undeveloped site will obviously take far longer than reinstating a 'brownfield' site or and 'existing' Licensed or Authorised site.

Each of the stages described in Table 14.4 are considered in-turn below.

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities

Landscape and Townscape

Option 1: Develop a Greenfield Site for Submarine Dismantling

Assessment of Effects:

There would be the potential for surface construction activities related to the development of SDP facilities and ancillary uses/supporting infrastructure to have significant negative landscape and visual effects where activities result in the fragmentation or loss of key landscape elements or features, or where the introduction of the surface facilities and infrastructure and surface bunding significantly alters the landscape character. Construction activities may have a detrimental effect on landscape character due to the introduction of new visual elements (construction compounds, construction machinery, cranes, spoil, hardstanding, and access roads), which may (depending on the exact location) contrast with the existing landscape.

Effects on landscape character could be direct (where a site is located within a designated area of landscape value), or indirect (where the setting of the surrounding landscape is affected). Construction activities may also have a negative visual effect through the introduction of new elements into existing views or the loss of views (e.g. where the diversion of a right of way or right of access prevents the receptor from seeing the view).

Effects on landscape could also include changes to the immediate coastline where new docking facilities will need to be constructed along with potential indirect effects from changes to coastal processes to the new facilities and the completion of dredging.

Lighting would be required throughout the construction phase (machinery, office/facilities and security lighting), resulting in light pollution. Although most construction works would be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution.

There may be a need to construct new transport infrastructure to the site, or undertake improvements to the existing road/rail network. These works may have a negative effect on the local landscape character along existing or proposed transport corridors where there is any fragmentation or loss of key landscape elements or features or where works significantly alter landscape character. The removal of boundary vegetation (e.g. hedgerows, grass verges etc) may increase the visibility of existing landscape features as well as proposed new landscape features (e.g. existing roads and settlements). Increases in construction traffic on local road networks may also affect the tranquillity of these areas.

Depending on the location of the site selected, there is potential for development on greenfield land to affect public access to open spaces and the countryside including coastal sites which would have a negative effect on this aspect of the objective.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities and infrastructure (e.g. roads, car parking, security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale and duration of construction would be reduced under RC/RPV storage options in the short term, it is expected that landscape/townscape effects associated with construction activities would also be less relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, further adverse effects may be generated in the longer term during construction of site elements required to support RC/RPV dismantling. Given that a size reduction facility would not be required in the short to medium term for RC/RPV storage options, adverse effects on landscape/townscape related to the presence of SDP facilities may also be less until such a time that the second phase of development is complete.

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities **Landscape and Townscape**	
Proposed Mitigation / Enhancements Measures: • At an early stage following site selection and prior to any construction works, a desk study and site walkover should be undertaken to determine the landscape character and quality of the site and its surrounds. Consideration should be given to the receiving environment and sensitivity of receptors and the potential effects on key views and designated landscape areas. In addition, effects on local landscape features, elements, character and quality and locally designated and undesignated areas of landscape value together with effects on local views should be considered. This would enable appropriate mitigation measures to be designed and implemented to have maximum impact in terms of reducing any negative effects. • The footprint of the facilities and infrastructure should be minimised as far as practically possible, and appropriately sited to reduce any landscape and visual effect. • Any loss of existing landscape elements such as woodland, trees, hedgerows and other planting within the site should be avoided where possible. Where vegetation within the site is of value, it should be retained where possible. • Where possible, any landscape planting should be carried out at an early stage to allow the development of vegetation to help filter views of the surface works prior to commencement of construction work on site. Any planting undertaken on or off-site should make use of locally native tree and shrub species. Dependent on its location, large belts or blocks of planting may not be characteristic of the landscape surrounding the site. • Negative effects from the introduction of new visual elements may be reduced by the use of appropriate siting and screening of the construction plant and roads (through the use of existing woodlands or copses, landscaped and planted earth mounds, using excavated spoil and suitable grass seed mixes, or appropriate native planting. Any spoil mounds, surface bunds and planting should be of a scale that is characteristic of the local landscape (e.g. in terms of topography and vegetation). • Buildings and infrastructure, including any temporary structures and compounds should be of a high quality design with due consideration given to the aesthetics in relation to existing local colours and architectural styles. The size of buildings should be kept to a practical minimum. • The colour and texture of surfaces should be considered and attempts should be made to minimise contrast with the landscape. Visual intrusion may be mitigated through the use of appropriate hardstanding materials (e.g. local crushed stone). • The use of fluorescent lighting should be minimised where possible to prevent overspill, glare and light pollution. The number and height of lighting poles should be reduced to a practicable minimum and directional shields used to control light spillage. • Adopt high quality design principles and landscaping in order to help conserve the character of local landscapes/townscapes and protect visual amenity.	
Summary: Option 1 has been assessed as having a significant negative effect on this objective with effects likely to be felt both in the short term during construction and in the longer term once development is complete. This reflects both the scale and form of development under this option which is likely to be incongruous to the character of the surrounding area. Depending on site location, there is also potential for development on greenfield land to affect public access to open spaces and the countryside including coastal sites. Under RC/RPV storage options construction of the size reduction facility would be delayed and therefore it is expected that landscape/townscape effects associated with construction activities would also be less relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities ‘up front’). However, further adverse effects may be generated in the longer term during construction of site elements required to support RC/RPV dismantling. Given that a size reduction facility would not be required in the short to medium term for RC/RPV storage options, adverse effects on landscape/townscape related to the presence of SDP facilities may also be less until such a time that the second phase of development is complete.	--

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities

Landscape and Townscape

Option 2: Develop a Brownfield Site for Submarine Dismantling

Assessment of Effects:

Effects on landscape and townscape related to construction activities are expected to be similar to those detailed under Option 1. However, it is assumed that the brownfield site taken forward for development would be located within or adjacent to an existing settlement and that development would be in keeping with its surrounds such that there is potential for the facility, once constructed, to be consistent with the existing built scale and form (for example, if the site is located within or adjacent to an existing dockyard). In addition, it is assumed that there would not be a need to construct docking facilities and consequently there would be no significant effects on seascape. There may also be potential for development to enhance the appearance of a locality for example, through construction on derelict land or replacement of poorly designed or vacant buildings. However, it is acknowledged that brownfield sites may be sensitively located for example, within the open countryside, within a Conservation Area or in close proximity to sensitive receptors where development of the scale and form proposed under this option could have a significant negative effect on landscape/townscape.

Subject to the location of development, it is considered unlikely that development on a brownfield site would inhibit access to open space or the countryside.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on a brownfield site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities (e.g. security centre and buffer storage). A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale and duration of construction would be reduced under RC/RPV storage options in the short term, it is expected that landscape/townscape effects associated with construction activities would also be less relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities ‘up front’). However, further adverse effects may be generated in the longer term during construction of site elements required to support RC/RPV dismantling. Given that a size reduction facility would not be required in the short to medium term for RC/RPV storage options, adverse effects on landscape/townscape related to the presence of SDP facilities may also be less until such a time that the second phase of development is complete.

Proposed Mitigation / Enhancements Measures:

- At an early stage following site selection and prior to any construction works, a desk study and site walkover should be undertaken to determine the landscape character and quality of the site and its surrounds. Consideration should be given to the receiving environment and sensitivity of receptors and the potential effects on key views and designated landscape areas. In addition, effects on local landscape features, elements, character and quality and locally designated and undesignated areas of landscape value together with effects on local views should be considered. This would enable appropriate mitigation measures to be designed and implemented to have maximum impact in terms of reducing any negative effects.
- The footprint of the facilities and infrastructure should be minimised as far as practically possible, and appropriately sited to reduce any landscape and visual effect.
- Any loss of existing landscape elements such as woodland, trees, hedgerows and other planting within the site should be avoided where possible. Where vegetation within the site is of value, it should be retained where possible.
- Where possible, any landscape planting should be carried out at an early stage to allow the development of vegetation to help filter views of the surface works prior to commencement of construction work on site. Any planting undertaken on or off-site should make use of locally native tree and shrub species. Dependent on its location, large belts or blocks of planting may not be characteristic of the landscape surrounding the site.

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities Landscape and Townscape	
• Negative effects from the introduction of new visual elements may be reduced by the use of appropriate siting and screening of the construction plant and roads (through the use of existing woodlands or copses, landscaped and planted earth mounds, using excavated spoil and suitable grass seed mixes, or appropriate native planting. Any spoil mounds, surface bunds and planting should be of a scale that is characteristic of the local landscape (e.g. in terms of topography and vegetation). • Buildings and infrastructure, including any temporary structures and compounds should be of a high quality design with due consideration given to the aesthetics in relation to existing local colours and architectural styles. The size of buildings should be kept to a practical minimum. • The colour and texture of surfaces should be considered and attempts should be made to minimise contrast with the landscape. Visual intrusion may be mitigated through the use of appropriate hardstanding materials (e.g. local crushed stone). • The use of fluorescent lighting should be minimised where possible to prevent overspill, glare and light pollution. The number and height of lighting poles should be reduced to a practicable minimum and directional shields used to control light spillage. • Adopt high quality design principles and landscaping in order to help conserve the character of local landscapes/townscapes and protect visual amenity.	
Summary: Development of a brownfield site is likely to have a short term and temporary negative effect on landscape/townscape as a result of construction activities which could result in the fragmentation or loss of key landscape elements or the introduction of new visual elements (construction compounds, construction machinery, cranes, spoil, hardstanding, and access roads), which may contrast with the existing landscape. For the purposes of this assessment it has been assumed that the development would be within or adjacent to an existing settlement and would be in-keeping with the character of the surrounding area such that the medium term impact on landscape/townscape would be minor. There may also be potential for development to enhance the appearance of a locality for example, through construction on derelict land or replacement of poorly designed or vacant buildings. However, there is potential for development on brownfield land to have a significant effect on this objective if sensitively located. Under RC/RPV storage options construction of the size reduction facility would be delayed and therefore it is expected that landscape/townscape effects associated with construction activities would also be less relative to Packaged Waste storage (which would require construction of all dismantling and size reduction facilities ‘up front’). However, further adverse effects may be generated in the longer term during construction of site elements required to support RC/RPV dismantling. Given that a size reduction facility would not be required in the short to medium term for RC/RPV storage options, adverse effects on landscape/townscape related to the presence of SDP facilities may also be less until such a time that the second phase of development is complete.	**-**
Option 3: Develop a Licensed/Authorised Site for Submarine Dismantling	
Assessment of Effects: Under Option 3, the scale of development is expected to be small relative to Options 1 and 2 reflecting the fact that construction of dismantling/size reduction facilities only would be required as infrastructure (e.g. roads) and ancillary facilities (e.g. administrative offices, stores) required to support the operation of the facility would already be present. Notwithstanding this, there is potential for construction activities to cause fragmentation or loss of key landscape elements or features or alter landscape character. Construction activities may also have a detrimental effect on landscape character due to the introduction of new visual elements (construction compounds, construction machinery, cranes, spoil, hardstanding, and access roads), which may contrast with the existing landscape. However, these effects are expected to be relatively minor and temporary such that they are not considered to be significant. It is assumed that the dismantling and size reduction facilities would be in-keeping with the character of an existing Licensed/Authorised site such that there is a strong likelihood that development would not have an adverse effect on landscape/townscape character. In addition, it is	

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities

Landscape and Townscape

assumed that there would not be a need to construct docking facilities and consequently there would be no significant effects on seascape. There may also be potential for development to enhance the appearance of a locality for example, through construction on derelict land or replacement of poorly designed or vacant buildings. Notwithstanding this, should the existing Licensed/Authorised site be located in a sensitive area such as the open countryside or a Conservation Area or the area of the site taken forward for development be located in close proximity to sensitive receptors, there is potential for development of the scale and form proposed under this option to have a negative effect on landscape/townscape.

Subject to the location of the site selected, it is considered unlikely that development within a Licensed/Authorised site would inhibit access to open space or the countryside.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar. However, the location and phasing of the construction of some site components will differ across the technical options, reflecting the scope of initial dismantling operations. For RC and RPV storage options, it is expected that development on an existing Licensed/Authorised site would require construction of an initial dismantling facility only comprising, amongst other elements, a dock bottom village (DBV) in the region of 12,500sqm as well as some ancillary facilities. A size reduction facility of approximately 5,000sqm would then be constructed at either the initial dismantling site (for RPV storage) or the interim storage facility (for RC storage) to support subsequent size reduction and packaging activities following a period of interim storage.

As the scale and duration of construction would be reduced under RC/RPV storage options in the short term, it is expected that landscape/townscape effects associated with construction activities would also be less relative to PW storage (which would require construction of all dismantling and size reduction facilities ‘up front’). However, further adverse effects may be generated in the longer term during construction of site elements required to support RC/RPV dismantling. Given that a size reduction facility would not be required in the short to medium term for RC/RPV storage options, adverse effects on landscape/townscape related to the presence of SDP facilities may also be less until such a time that the second phase of development is complete.

Proposed Mitigation / Enhancements Measures:

- At an early stage following site selection and prior to any construction works, a desk study and site walkover should be undertaken to determine the landscape character and quality of the site and its surrounds. Consideration should be given to the receiving environment and sensitivity of receptors and the potential effects on key views and designated landscape areas. In addition, effects on local landscape features, elements, character and quality and locally designated and undesignated areas of landscape value together with effects on local views should be considered. This would enable appropriate mitigation measures to be designed and implemented to have maximum impact in terms of reducing any negative effects.
- The footprint of the facilities and infrastructure should be minimised as far as practically possible, and appropriately sited to reduce any landscape and visual effect.
- Any loss of existing landscape elements such as woodland, trees, hedgerows and other planting within the site should be avoided where possible. Where vegetation within the site is of value, it should be retained where possible.
- Where possible, any landscape planting should be carried out at an early stage to allow the development of vegetation to help filter views of the surface works prior to commencement of construction work on site. Any planting undertaken on or off-site should make use of locally native tree and shrub species. Dependent on its location, large belts or blocks of planting may not be characteristic of the landscape surrounding the site.
- Negative effects from the introduction of new visual elements may be reduced by the use of appropriate siting and screening of the construction plant and roads (through the use of existing woodlands or copses, landscaped and planted earth mounds, using excavated spoil and suitable grass seed mixes, or appropriate native planting. Any spoil mounds, surface bunds and planting should be of a scale that is characteristic of the local landscape (e.g. in terms of topography and vegetation).
- Buildings and infrastructure, including any temporary structures and compounds should be of a high quality design with due consideration given to the aesthetics in relation to existing local colours and architectural styles. The size of buildings should be kept to a practical

Stage I: Designing & Developing the Initial Submarine Dismantling Facilities Landscape and Townscape	
minimum. • The colour and texture of surfaces should be considered and attempts should be made to minimise contrast with the landscape. Visual intrusion may be mitigated through the use of appropriate hardstanding materials (e.g. local crushed stone). • The use of fluorescent lighting should be minimised where possible to prevent overspill, glare and light pollution. The number and height of lighting poles should be reduced to a practicable minimum and directional shields used to control light spillage. • Adopt high quality design principles and landscaping in order to help conserve the character of local landscapes/townscapes and protect visual amenity.	
Summary: Construction activities associated with the development of dismantling/size reduction facilities on an existing Licensed/Authorised could result in the fragmentation or loss of key landscape elements or the introduction of new visual elements (construction compounds, construction machinery, cranes, spoil, hardstanding, and access roads), which may contrast with the existing landscape. However, in view of the scale of development proposed under this option and the temporary nature of these effects, it is not considered that their impact on landscape/townscape would be significant. For the purposes of this assessment it has been assumed that the development would be within or adjacent to an existing settlement and would be in-keeping with the character of the surrounding area such that the medium term impact on landscape/townscape would be minor. Moreover, there may also be potential for development to enhance the appearance of a locality for example, through construction on derelict land or replacement of poorly designed or vacant buildings. However, should the existing Licensed/Authorised site be located in a sensitive area or the area of the site taken forward for development be located in close proximity to sensitive receptors, there is potential for development of the scale and form proposed under this option to have a negative effect on this objective. Under RC/RPV storage options construction of the size reduction facility would be delayed and therefore it is expected that any landscape/townscape effects associated with construction activities would also be less relative to PW storage (which would require construction of all dismantling and size reduction facilities 'up front'). However, further adverse effects may be generated in the longer term during construction of site elements required to support RC/RPV dismantling. Given that a size reduction facility would not be required in the short to medium term for RC/RPV storage options, adverse effects on landscape/townscape related to the presence of SDP facilities may also be less until such a time that the second phase of development is complete.	**0**

Stage II: Designing and Developing the Interim ILW Storage Facilities

Landscape and Townscape

Option 1: Develop a Greenfield Site for ILW Storage

Assessment of Effects:

Given the generic nature of the construction proposals for the interim storage facility, it is assumed that the potential effects associated with this objective will be largely similar as for Stage 1 (construction of dismantling and size reduction facilities).

There would be the potential for surface construction activities related to the development of a storage facility to have negative landscape and visual effects where activities result in the fragmentation or loss of key landscape elements or features, or where the introduction of the surface facilities and infrastructure and surface bunding significantly alters the landscape character. Construction activities may have a detrimental effect on landscape character due to the introduction of new visual elements (construction compounds, construction machinery, cranes, spoil, hardstanding, and access roads), which may (depending on the exact location) contrast with the existing landscape.

Effects on landscape character could be direct (where a site is located within a designated area of landscape value), or indirect (where the setting of the surrounding landscape is affected). Construction activities may also have a negative visual effect through the introduction of new elements into existing views or the loss of views (e.g. where the diversion of a right of way or right of access prevents the receptor from seeing the view).

Lighting would be required throughout the construction phase (machinery, office/facilities and security lighting), resulting in light pollution. Although most construction works would be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution.

There may be a need to construct new transport infrastructure to the site, or undertake improvements to the existing road/rail network. These works may have a negative effect on the local landscape character along existing or proposed transport corridors where there is any fragmentation or loss of key landscape elements or features or where works significantly alter landscape character. The removal of boundary vegetation (e.g. hedgerows, grass verges etc) may increase the visibility of existing landscape features as well as proposed new landscape features (e.g. existing roads and settlements). Increases in construction traffic on local road networks may also affect the tranquillity of these areas.

Depending on the location of the site selected, there is potential for development on greenfield land to affect public access to open spaces and the countryside. However, in view of the scale of area required for development it is considered unlikely that such effects would be significant.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well as reception, admin, dispatching, inspection and maintenance areas. Additional infrastructure will also be required under this land use option such as a crane/cradle, docking facilities, security (standoff and centre), car parking, roads and internal rail line although the total area required for these additional features is unknown.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities, car parking, roads, crane/cradle and an external rail line will also be required under this land use option. Should RPVs be transported by sea (which is the most likely option) then docking facilities will also be required.
- Packaged Waste storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Additional infrastructure including security (standoff and centre), car parking, roads and an external rail line (if required), will also be required under this land use option. As Packaged Waste is likely to be transported by either road or rail it is assumed that there will be no need for docking facilities.

Storage of RCs will require construction of a relatively large facility compared to RPV and Packaged Waste storage options. This increases the potential for, and magnitude of, negative effects on landscape/townscape as a result of the increased scale and duration of construction activities in the short term and, once development is complete, the larger facility footprint. Moreover, the linear form of the vault area necessary to accommodate the storage requirements of RCs (which is estimated to be approximately 200m in length) could increase the potential for fragmentation of landscapes/townscapes and visual impacts. Increased construction traffic associated with this technical option may affect the tranquillity of areas alongside the road network.

Stage II: Designing and Developing the Interim ILW Storage Facilities Landscape and Townscape	
RC and RPV storage would require installation of a heavy lift crane/cradle for use during unloading once the storage facility is operational. Infrastructure of this scale could have a detrimental effect on this objective where the presence of such equipment alters landscape/townscape character or disrupts visual amenity although the severity is dependent on the height of the equipment, its location both within the site and in the context of the surrounding area, the existing landscape/townscape character and the proximity of sensitive receptors. Both RC and RPV storage options also require a coastal location and development may therefore result in changes to the immediate coastline to accommodate new docking facilities along with potential indirect effects from changes to coastal processes due to the new facilities and the completion of dredging. **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities on a greenfield site).	
Summary: Construction of a storage facility may have a negative effect on landscape and townscape both in the short term during construction and in the longer term once development is complete. Development on greenfield land will also require provision of supporting infrastructure which could have a negative effect on the local landscape character along existing or proposed transport corridors. Increases in construction traffic on local road networks may also affect the tranquillity of these areas. The severity of these effects may vary depending upon the type of storage facility constructed. In this respect, it is anticipated that storage of RCs will require construction of a relatively large facility with an area in the region of 11,600m^2 (excluding infrastructure which would include docking facilities) compared to RPV and Packaged Waste storage options which require facilities with a floorspace of 800m^2 and 1,000m^2 respectively (excluding infrastructure). Depending on location, development of a RC storage facility could therefore increase the potential for, and magnitude of, negative effects on landscape/townscape as a result of both the increased scale of construction activities and the larger facility footprint. The linear form of the vault area necessary to accommodate the storage requirements of RCs could increase the potential for fragmentation of landscapes/townscapes and visual impacts. RC and RPV storage options would require installation of a heavy lift crane/cradle which could have a detrimental effect on this objective depending on the height of the equipment, its location both within the site and in the context of the surrounding area, the existing landscape/townscape character and the proximity of sensitive receptors. Both technical options also require a coastal location and development may therefore result in changes to the immediate coastline to accommodate new docking facilities along with potential indirect effects from changes to coastal processes due to the new facilities and the completion of dredging. Depending on site location, there is potential for development on greenfield land to affect public access to open spaces and the countryside including coastal sites.	**-/--**
Option 1: Develop a Brownfield Site for ILW Storage	
Assessment of Effects: The potential effects on landscape and townscape related to construction activities are expected to be similar to those detailed under Option 1. It is assumed that the brownfield site taken forward for development would be located within or adjacent to an existing settlement and, consequently, there is potential for development to be in keeping with its surrounds (for example, if the site is located within or adjacent to an existing dockyard) although this may be dependent on the technical option taken forward. In addition, there would not be a need to construct docking facilities and consequently there would be no significant effects on seascape. There may also be potential for development to enhance the appearance of a locality, for example through construction on derelict land or replacement of poorly designed or vacant buildings. However, it is acknowledged that brownfield sites may be sensitively located for example, within the open countryside, within a Conservation Area or in close proximity to sensitive receptors where development of the scale and form	

Stage II: Designing and Developing the Interim ILW Storage Facilities Landscape and Townscape	
proposed under this option could have a negative effect on landscape/townscape. Subject to the location of development, it is considered unlikely that development on a brownfield site would inhibit access to open space or the countryside. **Technical Options:** • RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well as reception, admin, dispatching, inspection and maintenance areas. Security facilities including a security centre and standoff area will also be required together with an internal rail line and crane/cradle. However, it is assumed that docking facilities, car parking and roads will already be present. • RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required together with a crane/cradle. It is assumed that car parking, roads and docking facilities (should RPVs be transported by sea) will already be present. • Packaged Waste storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). Security facilities including a security centre and standoff area will also be required. It is assumed that car parking, roads and external rail line (if required) will already be present. As Packaged Waste is likely to be transported by either road or rail it is assumed that there will be no need for a docking facility. Storage of RCs will require construction of a relatively large facility compared to RPV and Packaged Waste storage options. This increases the potential for, and magnitude of, negative effects on landscape/townscape as a result of the increased scale and duration of construction activities. Increased construction traffic associated with this technical option may also affect the tranquillity of areas alongside the road network. A facility capable of accommodating RCs may be consistent with the existing built form (e.g. should the facility be located within an industrial area) however, the potential for negative effects on landscape/townscape are considered to be greater than for RPV and Packaged Waste storage options given both the scale and form of the facility. RC and RPV storage would require installation of a heavy lift crane/cradle for use during unloading once the storage facility is operational. The presence of such infrastructure may be in-keeping with the locality (e.g. if the facility is located within an existing dock comprising similar equipment) although in view of the likely height of such infrastructure, it is considered likely that the presence of such equipment would alter landscape/townscape character or disrupt visual amenity. **Proposed Mitigation / Enhancements Measures:** • Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).	
Summary: Development of a brownfield site may have a short term and temporary negative effect on landscape/townscape due to construction activities which could result in the fragmentation or loss of key landscape elements or the introduction of new visual elements (construction compounds, construction machinery, cranes, spoil, hardstanding, and access roads), which may contrast with the existing landscape. However, in view of the scale of construction activities likely to be required to support development of a storage facility it is not expected that these effects would be significant. For the purposes of the assessment it has been assumed that under this option, the storage facility would be within or adjacent to an existing settlement such that there is potential for development to be in keeping with its surrounds although this is likely to be dependent on the technical option taken forward. In this respect, the severity of landscape/townscape effects may be increased particularly if development comprises a RC storage facility given both the increased footprint relative to RPV and Packaged Waste storage options, the linear form of the vault area which is necessary to accommodate the storage requirements of RCs and the installation of heavy lift craneage/cradles (which would also be required for RPV storage). The severity of effects may also be increased should the storage facility be sensitively located. There may be potential for development to enhance the appearance of a locality for example, through construction on derelict	**0/-**

Stage II: Designing and Developing the Interim ILW Storage Facilities Landscape and Townscape	
land or replacement of poorly designed or vacant buildings.	

Option 3: Develop a Licensed/Authorised Site for ILW Storage

Assessment of Effects:

The potential effects on landscape and townscape related to construction activities are expected to be similar to those detailed under Options 1 and 2.

It is assumed that the storage facility would be in-keeping with the character of an existing Licensed/Authorised site such that there is a strong likelihood that development would not have an adverse effect on landscape/townscape character although this may be influenced by the technical option implemented. There may also be potential for development to enhance the appearance of a locality, for example through construction on derelict land or replacement of poorly designed or vacant buildings. Notwithstanding this, should the existing Licensed/Authorised site be located in a sensitive area, such as the open countryside or a Conservation Area, or the area of the site taken forward for development be located in close proximity to sensitive receptors, there is potential for development of the scale and form proposed under this option to have a negative effect on landscape/townscape.

Subject to the location of the site selected, it is considered unlikely that development within a Licensed/Authorised site would inhibit access to open space or the countryside.

Technical Options:

- RC storage will require a facility with an area in the region of 11,600m^2. This includes the total vault area as well as reception, admin, dispatching, inspection and maintenance areas. It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present although installation of a crane/cradle will be required.
- RPV storage will require a facility with an area in the region of 801m^2 (including the total vault area and reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as docking facilities, security (standoff and centre), car parking, roads and internal rail line are assumed to be already present although installation of a crane will be required.
- Packaged Waste storage will require a facility with an area in the region of 1,004.6m^2 (including the total vault area as well as reception, admin, dispatching, inspection and maintenance areas). It is assumed that there will be no additional infrastructure required as security (standoff and centre) car parking and roads are assumed to be already present.

As the range of potential effects on this objective are expected to be similar to (or less than) Option 2, the influence on their severity as a result of the implementation of the technical options above is also expected to be similar.

Proposed Mitigation / Enhancements Measures:

- Given the generic nature of the construction requirements of the interim storage facility, the proposed mitigation measures are considered to be the same as those proposed for Stage 1 (for construction of dismantling and size reduction facilities).

Summary: The type of effects on landscape and townscape identified in relation to the construction of a storage facility on a brownfield site (as described above) are expected to be similar (or less) for Option 3 as it is assumed that a Licensed/Authorised site would comprise all supporting infrastructure and any ancillary facilities (excluding craneage). Development on an existing Licensed/Authorised site may have a short term and temporary negative effect on landscape/townscape due to construction activities which could result in the fragmentation or loss of key landscape elements or the introduction of new visual elements (construction compounds, construction machinery, cranes, spoil, hardstanding, and access roads), which may contrast with the existing landscape. However, in view of the scale of construction activities likely to	**0/-**

Stage II: Designing and Developing the Interim ILW Storage Facilities Landscape and Townscape	
be required to support development of a storage facility it is not expected that these effects would be significant. Under this option there is potential for the storage facility to be in keeping with its surrounds although this is likely to be dependent on the technical option taken forward. In this respect, the severity of landscape/townscape effects may be increased particularly if development comprises a RC storage facility given both the increased footprint relative to RPV and Packaged Waste storage options, the linear form of the vault area which is necessary to accommodate the storage requirements of RCs and the installation of heavy lift craneage/cradles (which would also be required for RPV storage). The severity of effects may also be increased should the storage facility be sensitively located. There may be potential for development to enhance the appearance of a locality for example, through construction on derelict land or replacement of poorly designed or vacant buildings.	

Stage III: Docking the Submarines and Processing the Reactor Compartments **Landscape and Townscape**
Option 1: Dock Submarine & Cut-Out Reactor Compartment

Assessment of Effects:

Potential effects on landscape and townscape associated with RC initial dismantling primarily relate to the temporary installation of large scale equipment. This equipment may include any additional cranes or cradles required to support RC removal and could have a detrimental effect on this objective where the presence of such equipment alters landscape/townscape character or disrupts visual amenity. Effects on landscape/townscape character could be direct (where this equipment is within a designated area of landscape value), or indirect (where the setting of the surrounding landscape is affected). The severity of these effects is dependent on the height of the equipment, its location both within the site and in the context of the surrounding area, the existing landscape/townscape character and the proximity of sensitive receptors. However, it is assumed that such equipment would only be required on a temporary basis and primarily during the physical removal of the RC such that the effects are unlikely to be significant.

There is potential for the initial transportation and docking of submarines to have a negative effect on coastal landscapes and seascape. The use of heavy lift vessels in particular may disrupt views and alter landscape character both at the site of embarkation and at the dismantling facility (although there is potential for seascape to be temporally affected along the transport route). The severity of this effect is dependent on the type of vessel(s) utilised to support transportation, the existing landscape/seascape character, the proximity of sensitive receptors and the route taken during transportation. Notwithstanding this, it is considered that effects will only be temporary and infrequent with one submarine being docked per year and any impacts will be similar to those associated with other passing ships/maritime activity such that effects are not expected to be significant. Effects on the character of the coastline and seascape could also be caused by dredging activities required to maintain the accessibility of docking facilities. However, these effects are also expected to be infrequent and temporary and as such are not considered to be significant.

Lighting would be required during the operational phase (equipment, office/facilities and security lighting), resulting in light pollution. Although operational activities would be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution.

Proposed Mitigation / Enhancements Measures:

- In considering the layout of the dismantling facility, early consideration should be given to the likely location and type of temporary equipment that will be required in order to identify those locations where the introduction of new visual elements could have a negative effect on landscape/townscape character and visual amenity and enable appropriate mitigation measures to be designed and implemented to have maximum impact in terms of reducing any negative effects.
- Temporary equipment which may have a negative effect on landscape/townscape and visual amenity should be not be retained on-site for longer than is necessary to support operational activities.
- The use of fluorescent lighting should be minimised where possible to prevent overspill, glare and light pollution.

Summary: Operation of a RC dismantling facility could have a negative effect on landscape and townscape as a result of the temporary use of large scale equipment such as cranes or cradles. However, in view of the temporary nature of the equipment it is anticipated that this effect would be minor although it is recognised that there is potential for its severity to be increased should the dismantling facility be sensitively located. There is also potential for the initial transportation and docking of submarines and dredging to have a negative effect on coastal landscapes and seascape although it is considered that any impacts will only be temporary and similar to those caused by other passing ships/maritime activity such that any negative effects are not expected to be significant.	**0**

Stage III: Docking the Submarines and Processing the Reactor Compartments Landscape and Townscape	
Option 2: Dock Submarine & Cut-Out Reactor Pressure Vessel	
Assessment of Effects: The type and range of effects on landscape and townscape as a result of RPV initial dismantling are expected to be similar to those associated with Option 1. Depending on the method adopted, RPV removal may require additional heavy lifting craneage which could significantly affect landscape character and visual amenity where the presence of such equipment alters landscape/townscape character or disrupts visual amenity. Effects on landscape/townscape character could be direct (where a site is located within a designated area of landscape value), or indirect (where the setting of the surrounding landscape is affected) although their severity is dependent on the location of such equipment in the context of both the site and wider area, the existing landscape/townscape character and proximity of sensitive receptors. However, it is assumed that such equipment would only be required on a temporary basis and primarily during the physical removal of the RPV such that the effects are unlikely to be significant. Under Option 2 there would be a need to transport LLW to the National LLW Repository in Cumbria during the initial dismantling phase. It is assumed that LLW would be transported by road such that there is likely to be additional HGV movements beyond those associated with the movement of materials, equipment and non-radioactive waste which may have an adverse impact on the visual amenity and tranquillity of communities alongside local transport networks. The severity of these effects is dependent upon the location of the dismantling facility, HGV routing and the proximity of sensitive receptors. However, it is assumed that the number of LLW movements per annum would be minor and in-combination with other HGV movements would not have a significant effect on this objective. There may also be an opportunity to transport LLW by rail or, given the coastal location, sea which could reduce these effects. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: There is potential for RPV initial dismantling to have a negative effect on landscape and townscape as a result of HGV movements required to transport waste (including LLW) and equipment to and from the dismantling facility and the temporary use of large scale equipment which may include heavy lifting craneage. However, in view of the low volume of HGV movements related to operational activities and the temporary nature of equipment it is anticipated that these effects would be minor although it is recognised that there is potential for their severity to be increased should the dismantling facility be sensitively located. There is also potential for the initial transportation and docking of submarines and dredging to have a negative effect on coastal landscapes and seascape although it is considered that any impacts will only be temporary and similar to those caused by other passing ships/maritime activity such that any negative effects are not expected to be significant.	**0**
Option 3: Dock Submarine & Cut-up Packaged Waste	
Assessment of Effects: The operational effects of Option 3 on landscape and townscape are expected to be similar to those associated with Option 2 since RC/RPV cut out will also take place under this option. It is also assumed that processing would be undertaken inside a dismantling facility building and would therefore not require any additional external equipment to that associated with RC/RPV cut-out. Full dismantling is expected to generate a greater number of HGV movements in the medium term relative to Options 1 and 2 (given that the volumes of waste (including LLW), materials and equipment will be greater) which could increase the potential adverse effects on the visual amenity and tranquillity of communities alongside local transport networks. The severity of these effects is dependent upon the location of the dismantling facility, HGV routing and the proximity of sensitive receptors although it is assumed that the number of HGV movement per annum would be small such that there is unlikely to be a significant effect on this objective. There may also be an opportunity to utilise rail or, given the	

Stage III: Docking the Submarines and Processing the Reactor Compartments Landscape and Townscape	
coastal location, sea which could reduce any negative effects. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Option 3 will require the use of temporary large scale equipment during RC/RPV cut-out which could have a negative effect on landscape and townscape where the presence of such equipment alters landscape/townscape character or disrupts visual amenity. However, it is assumed that such equipment would only be required on a temporary basis and primarily during the physical removal of the RPV such that the effects would not be significant. It is expected that RPV cut-up will be undertaken within a dismantling facility and consequently there would not be any significant effects on landscape and townscape associated with the use of equipment during this phase of operational activity. HGV movements required to transport waste (including LLW), materials and equipment to and from the dismantling site may have adverse effects on the visual amenity and tranquillity of communities alongside local transport networks. However, it is assumed that the number of HGV movement per annum would be small such that there would not be a significant effect on this aspect of the objective. There is also potential for the initial transportation and docking of submarines and dredging to have a negative effect on coastal landscapes and seascape although it is considered that any impacts will only be temporary and similar to those caused by other passing ships/maritime activity such that any negative effects are not expected to be significant.	**0**

Stage IV: Dismantling the Residual Submarine Hulls and Processing Wastes Landscape and Townscape	
All Options	
Assessment of Effects: It is expected that activities associated with preparatory works at the dismantling facility should not require any additional large scale plant equipment to that already used during processing (i.e. – stage 3). Furthermore, all large scale plant equipment should already be in use and located at the ship recycling facility. As a result, the use of large scale plant equipment during this stage of the SDP process should not have any effect on setting or visual amenity. Additional effects on landscape and townscape relate to HGV movements required to transport recyclates, items for reuse and waste for disposal to/from site which may have a negative effect on the visual amenity and tranquillity of communities alongside local transport networks in the vicinity of both the dismantling facility and ship recycling facility. The severity of these effects is dependent upon the location of the facilities, HGV routing and the proximity of sensitive receptors. However, it is assumed that the volume of movements associated with initial preparation of submarines at the dismantling facility (either alone or in combination with other activities at the site) would be low given the nature of works to be undertaken and the volumes of waste likely to be generated such that effects on landscape and townscape are not expected to be significant. Whilst the volume of HGV movements generated by the break up of submarine hulls and removal of large equipment will be greater, they are expected to be similar to those associated with the existing operation of the ship recycling facility. There is potential for the transportation of the submarines to have a negative effect on coastal landscapes and seascape. The use of heavy lift vessels in particular may disrupt views and alter landscape character both at the dismantling facility and the ship recycling facility (although there is potential for seascape to be temporally affected along the transport route). The severity of this effect is dependent on the type of vessel(s) utilised to support transportation, the existing landscape/seascape character, the proximity of sensitive receptors and the route taken during transportation. Notwithstanding this, it is considered that effects will only be temporary and infrequent with one movement per year and any impacts will be similar to those associated with other passing ships/maritime activity such that effects are not expected to be significant. **Proposed Mitigation / Enhancements Measures:** • Adopt HGV routing which minimises negative effects on sensitive receptors. • Any temporary plant equipment that may have a negative effect on visual amenity should not be retained on site for longer than is necessary to support operational activities.	
Summary: Recycling of the submarines could have a negative effect on landscape and townscape as a result of HGV movements. However, HGV movements associated with submarine preparation at the dismantling facility are not expected to be significant whilst the number of movements related to the subsequent break up hulls and removal of large equipment will be similar to those associated with the existing operation of the ship recycling facility. Consequently, it is anticipated that these effects would be minor although it is recognised that there is potential for the severity of these effects to be increased should the dismantling facility be sensitively located. There is also potential for the transportation of submarines to have a negative effect on coastal landscapes and seascape although it is considered that any impacts will only be temporary and similar to those caused by other passing ships/maritime activity such that any negative effects are not expected to be significant.	**0**

Stage V: Transport RC/RPV/ILW to Interim Storage Landscape and Townscape	
Option 1: Reactor Compartment Transport and Storage	
Assessment of Effects: This stage of the SDP process will not require the construction of new buildings or infrastructure at either the dismantling facility or storage facility and it is assumed that any large scale equipment (e.g. cranes required to load/unload RCs) would be developed during Stages 1 and 2. Consequently, it is envisaged that the type of effects on landscape and townscape will be similar to those identified under Stages 3 and 4. RC storage will generate some HGV movements primarily associated with the transportation of wastes, equipment and materials to support maintenance activities which may have a negative effect on the visual amenity and tranquillity of communities alongside local transport networks. However, it is anticipated that the number of vehicle movements would be very low such that any effects are unlikely to be significant and there may be an opportunity to utilise sea or rail transport modes which would reduce any adverse effects further. Lighting would be required during the operational phase (equipment, office/facilities and security lighting), resulting in light pollution. Although operational activities would be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution. **Proposed Mitigation / Enhancements Measures:** • The use of fluorescent lighting should be minimised where possible to prevent overspill, glare and light pollution.	
Summary: Interim storage will generate some HGV movements which may have a negative effect on the visual amenity and tranquillity of communities alongside local transport networks, especially in sensitive areas. However, in view of the anticipated number of movements associated with this stage of the SDP process, it is not expected that this effect would be significant. Lighting of the storage facility and associated infrastructure will generate some light pollution although this will be reduced through the use of appropriate shielding.	**0**
Option 2: Reactor Pressure Vessel Transport and Storage	
Assessment of Effects: Landscape and townscape effects under this option are expected to be similar to those associated with RC storage (Option 1 above). There is potential for RPVs to be transported by road which would require the use of a wide/abnormal load vehicle and security escort and could have a negative effect on the visual amenity and tranquillity of communities along the transport corridor. However, any effects would only be temporary and infrequent as it is envisaged that only one RPV would be transported per year. The geographical extent of effects would also be limited as it is not envisaged that RPVs would be moved over significant distances. **Proposed Mitigation / Enhancements Measures:** • The use of fluorescent lighting should be minimised where possible to prevent overspill, glare and light pollution.	
Summary: RPVs may be transported by road, rail or sea. Should RPVs be transported by road, there may be negative effects on the visual amenity and tranquillity of communities alongside the transport corridor as a result of the use of wide/abnormal load vehicles. However, as only one RPV would be transported per year it is not expected that negative effects would be significant. Storage activities will generate some HGV movements which may also have a negative effect on the visual amenity and tranquillity of communities especially in sensitive areas. However, in view of the anticipated number of movements associated with this stage of the SDP process, it is not expected that this effect would be significant (either alone or in combination with	**0**

other HGV movements associated with this stage of the SDP process). Lighting of the storage facility and associated infrastructure will generate some light pollution although this will be reduced through the use of appropriate shielding.	
Option 3: Packaged Waste Transport and Storage	
Assessment of Effects: It is assumed that Packaged Waste would be transported by road using a standard articulated HGV and that up to approximately 8 movements would be required per annum. Subject to the location of both the dismantling facility and storage facility, it is not expected that the movements required under this option would be of a scale that would have a significant negative effect on the visual amenity and tranquillity of communities alongside the transport corridor. Any effects may also be reduced should Packaged Waste be transported by sea or rail. However, it is recognised that the severity of these effects may be increased should the dismantling facility or storage facility be sensitively located. Landscape and townscape effects associated with the subsequent storage of Packaged Waste (e.g. lighting and HGV movements required to transport waste, materials and equipment) are expected to be similar to those identified under Options 1 and 2. **Proposed Mitigation / Enhancements Measures:** • The use of fluorescent lighting should be minimised where possible to prevent overspill, glare and light pollution.	
Summary: HGV movements associated with the transportation of Packaged Waste could have a negative effect on the visual amenity and tranquillity of communities alongside transport corridors. However, as only an estimated 8 movements would be required per annum, it is not expected that these effects would be significant although their severity may be increased should the dismantling facility or storage facility be sensitively located. Storage activities will also generate some HGV movements which may have a negative effect on the visual amenity and tranquillity of communities, especially in sensitive areas. However, in view of the anticipated number of movements associated with this stage of the SDP process, it is not expected that this effect would be significant (either alone or in combination with other HGV movements associated with this stage of the SDP process). Lighting of the storage facility and associated infrastructure will generate some light pollution although this will be reduced through the use of appropriate shielding.	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Landscape and Townscape	
Option 1: Reactor Compartment Segregation and Size Reduction, PW Transfer to Proposed GDF	
Assessment of Effects: Depending on the location of the dismantling facility for removal of the RPV from the RC, and the size reduction facility for the packaging of ILW vis-à-vis the interim storage facility, there may be a requirement to transport RC's prior to processing, it is expected due to the size and weight of RC that this will only occur by sea and by barge. This movement is expected to be of a similar nature to other ocean going movements and therefore unlikely to cause any effects under this option Depending on the method adopted, initial RPV removal from the RC may require additional heavy lifting craneage which could have an adverse effect on this objective where the presence of such equipment alters landscape/townscape character or disrupts visual amenity. Effects on landscape/townscape character could be direct (where a site is located within a designated area of landscape value), or indirect (where the setting of the surrounding landscape is affected) although their severity is dependent on the location of such equipment in the context of both the site and wider area, the existing landscape/townscape character and proximity of sensitive receptors. However, it is assumed that such equipment would only be required on a temporary basis (during the physical removal of the RPV) such that the effects are unlikely to be significant. It is assumed that RPV processing and packaging of ILW would be undertaken inside a size reduction facility building and would therefore not require any additional externally sited equipment. HGV movements associated with the transportation of materials, equipment and waste (including LLW and PW) may have an adverse impact on the visual amenity and tranquillity of communities alongside local transport networks. The severity of these effects is dependent upon the location of the size reduction facility, HGV routing and the proximity of sensitive receptors. However, it is assumed that the number of movements per annum would be minor and would not have a significant effect on this objective. There may also be an opportunity to utilise rail or, given the coastal location, sea which could reduce these effects. Works occurring to undertake the recycling of the RC casing will be of a similar nature to those already occurring on site. Consequently, it is not expected that there would be a considerable increase in the number of HGV movements or a significant change to the baseline. Lighting would be required during the operational phase (equipment, office/facilities and security lighting), resulting in light pollution. Although operational activities would be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution. **Proposed Mitigation / Enhancements Measures:** • In considering the layout of the size reduction facility, early consideration should be given to the likely location and type of temporary equipment that will be required in order to identify those locations where the introduction of new visual elements could have a negative effect on landscape/townscape character and visual amenity and enable appropriate mitigation measures to be designed and implemented to have maximum impact in terms of reducing any negative effects. • Temporary equipment which may have a negative effect on landscape/townscape and visual amenity should not be retained on-site for longer than is necessary to support operational activities. • The use of fluorescent lighting should be minimised where possible to prevent overspill, glare and light pollution.	
Summary: Option 1 is expected to require the use of temporary large scale equipment during RPV cut-out which could have a negative effect on landscape and townscape where the presence of such equipment alters landscape/townscape character or disrupts visual amenity. However, it is assumed that such equipment would only be required on a temporary basis such that the effects would not be significant. It is expected that RPV processing and packaging of ILW will be undertaken within a size reduction facility building and consequently there would not be any significant effects on landscape and townscape associated with the use of equipment during this phase of operational activity. HGV movements required to transport waste (including LLW and Packaged Waste), materials and equipment to and from the size reduction facility may have adverse effects on the visual amenity and tranquillity of communities alongside local transport networks. However, it is assumed that the number of HGV movement per annum would be small such that there would not be a	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF Landscape and Townscape	
significant effect on this aspect of the objective. Lighting of the size reduction facility will generate some light pollution although this will be reduced through the use of appropriate shielding.	
Option 2: Reactor Pressure Vessel Segregation and Size Reduction, PW Transfer to Proposed GDF	
Assessment of Effects: There is potential for RPVs to be transported by road from the interim storage facility to the size reduction facility which would require the use of a wide/abnormal load vehicle and security escort and could have a negative effect on the visual amenity and tranquillity of communities along the transport corridor. However, any effects would only be temporary and infrequent as it is envisaged that only one RPV would be transported per year. The geographical extent of effects would also be limited as it is not envisaged that RPVs would be moved over significant distances and in this respect, there may be a preference to co-locate the interim storage facility and size reduction facility under this option. Under Option 2 it is expected that RPV dismantling and packaging of ILW would be undertaken inside a size reduction facility building with works requiring the cutting of the RC hull having been undertaken during Stage 3. Consequently, it is considered unlikely that there would be any significant landscape/townscape effects directly related to operational activity under this option. The number of HGV movements under this option is likely to be lower than for Option 1 as the volume of waste arisings (both LLW and non-radioactive) would be reduced (as systems and equipment contained within the RC will have already been removed and some size and weight reduction of the RPV would have been undertaken during Stage 3). Consequently, it is likely that the potential for adverse impacts on the visual amenity and tranquillity of communities alongside local transport networks may also be reduced although this is dependent upon the location of the size reduction facility, HGV routing and the proximity of sensitive receptors. As identified under Option 1, lighting would be required during the operational phase (equipment, office/facilities and security lighting), resulting in light pollution. Although operational activities would be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: RPVs may be transported from the interim storage to the size reduction facility by road, rail or sea. Should RPVs be transported by road, there may be negative effects on the visual amenity and tranquillity of communities alongside the transport corridor as a result of the use of wide/abnormal load vehicles. However, as only one RPV would be transported per year it is not expected that negative effects would be significant. RPV dismantling and ILW packaging would be undertaken inside a size reduction facility building and consequently it is considered unlikely that there would be any significant landscape/townscape effects directly related to operational activity under this option. HGV movements required to transport waste (including LLW and PW), materials and equipment to and from the size reduction facility may have adverse effects on the visual amenity and tranquillity of communities alongside local transport networks. However, it is assumed that the number of HGV movement per annum would be small such that there would not be a significant effect on this aspect of the objective. Lighting of the size reduction facility will generate some light pollution although this will be reduced through the use of appropriate shielding.	**0**

Stage VI: Dismantling RC/RPV (if required) and Transferring Packaged ILW to the Proposed GDF **Landscape and Townscape**	
Option 3: Transport Packaged Waste to Proposed GDF	
Assessment of Effects: Under Option 3 all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process) and consequently, effects on this objective will relate to the transportation of Packaged Waste to the proposed GDF only. These effects are expected to be similar to those associated with the transportation of Packaged Waste identified under Options 1 and 2. There is the potential for Packaged Waste to be transported at a higher frequency than 8 separate movements per annum (subject to the number of over packs available and proposed GDF availability to receive Packaged Waste) as under this option no further processing prior to transportation to the proposed GDF would be required. As a high end estimate, if all Packaged Waste was to be moved over a period of 1 year with the existing number of overpacks (2), transport movements would occur approximately 4 times per week. Movements of this frequency could have an adverse impact on the visual amenity and tranquillity of communities alongside local transport networks. However, taking into account the fact that there would be no (or very few) standard HGV movements associated with this option and that any adverse effects would only be temporary (within the context of a project lasting decades), it is not expected that this frequency of movement would result in a significant negative effect on this aspect of the objective although it is recognised that this is dependent on a number of factors including whether Packaged Waste is transported by road or rail, the timing and routing of movements and the proximity of sensitive receptors. **Proposed Mitigation / Enhancements Measures:** • No additional mitigation measures proposed above those set out for Option 1.	
Summary: Under Option 3 all dismantling and packaging activities will have been undertaken up-front (i.e. during Stage 3 of the SDP process). It is assumed that Packaged Waste would be transported by road requiring the use of a wide/abnormal load vehicle and security escort which could have a negative effect on the visual amenity and tranquillity of communities alongside transport corridors. However, as only an estimated 8 movements would be required per annum, it is not expected that these effects would be significant although their severity may be increased should the interim storage facility be sensitively located or the frequency of movements be increased. There may also be an opportunity to transport Packaged Waste by sea or rail which could reduce any negative effects.	**0**

Stage VII: Decommissioning the SDP Facilities

Landscape and Townscape

Option 1: Decommission Greenfield Sites

Assessment of Effects:

Decommissioning activities are expected to generate similar effects on landscape and townscape to those associated with the construction of SDP facilities (Stages 1 and 2 of this assessment). It is expected that the duration of works would be longer given the more complex nature of decommissioning activities (particularly associated with the treatment of radiologically contaminated materials) and therefore there is potential for the severity of these effects to be increased. That being said, there should be reflection that there may be greater potential for decommissioning activities to be in-keeping with landscape/townscape character as sites will have already undergone development, altering the baseline.

There would be the potential for surface decommissioning activities to have negative landscape and visual effects as a result of the introduction of new visual elements (e.g. temporary ILW packaging facilities, compounds, machinery, cranes and spoil) which may (depending on the exact location) contrast with the existing landscape. Effects on landscape character could be direct (where a site is located within a designated area of landscape value), or indirect (where the setting of the surrounding landscape is affected). However, it is expected that landscape and townscape character will be returned to the existing baseline as surface facilities, infrastructure and decommissioning plant are removed.

It is envisaged that lighting would be required throughout the decommissioning phase (machinery, office/facilities and security lighting), resulting in light pollution. Although most works would be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution. Following the completion of the decommissioning phase, all lighting will have been removed and the existing baseline re-established.

HGV movements associated with the transportation of equipment, waste and materials to/from SDP sites may affect the tranquillity of areas alongside local transport networks for the duration of the decommissioning phase.

Following completion of decommissioning activities it is expected that restoration works will significantly enhance local landscape and townscape character as surface facilities, infrastructure and decommissioning plants are removed and the sites are restored to greenfield condition. It is also assumed that public access to open spaces or the countryside lost as a result of construction facilities would be restored.

Technical Options:

All three technical options will ultimately require RC/RPV dismantling and packaging of ILW and, consequently, it is assumed that the total footprint of dismantling and size reduction facilities will be similar (in the region of 12,500sqm and 5,000sqm respectively excluding supporting infrastructure and ancillary facilities). However, the size of the interim storage facility and required infrastructure will vary depending on the technical option implemented. The surface area requirements for each of the interim storage options are set out under Stage 2 of this assessment.

RC storage will require decommissioning of a relative large facility compared to RPV and PW storage options, increasing the potential for, and magnitude of, negative effects on landscape/townscape in the vicinity of the facility (due to the increased scale and duration of decommissioning activities). Increased construction traffic associated with this technical option may also affect the tranquillity of areas alongside the road network.

Proposed Mitigation / Enhancements Measures:

- Prior to the commencement of decommissioning works, a desk study and site walkover should be undertaken to re-assess the landscape character and quality of SDP sites and their surrounds. Consideration should be given to the receiving environment and sensitivity of receptors and the potential effects on key views and designated landscape areas. In addition, effects on local landscape features, elements, character and quality and locally designated and undesignated areas of landscape value together with effects on local views should be considered. This would enable appropriate mitigation measures to be designed and implemented to have maximum impact in terms of reducing any negative effects.
- Opportunities should be explored to enhance the appearance of sites following decommissioning e.g. through appropriate landscaping and planting. Any planting undertaken on or off-site should make use of locally native tree and shrub species. Dependent on its location, large belts or blocks of planting may not be characteristic of the landscape surrounding the sites.

Stage VII: Decommissioning the SDP Facilities Landscape and Townscape	
• Negative effects from the introduction of new temporary visual elements may be reduced by the use of appropriate siting and screening of the decommissioning plant. • The use of fluorescent lighting should be minimised where possible to prevent overspill, glare and light pollution. The number and height of lighting poles should be reduced to a practicable minimum and directional shields used to control light spillage.	
Summary: Option 1 has been assessed as having a significantly positive effect on this objective in the long term as restoration works will restore greenfield conditions significantly enhancing local landscape and townscape character comparing to during operation of the SDP. It is also assumed that public access to open spaces or the countryside (which may have been lost as a result of the construction of SDP facilities) would be restored. Restoration of the site is assumed to be consistent with the prevailing landscape quality and will be viewed by local communities as a beneficial return to a more tranquil and pleasant environment over the long term. However, decommissioning activities may have a short to medium term negative effect on landscape and townscape primarily due to the introduction of new visual elements, which may contrast with the existing landscape and/or interrupt or result in the loss of views. However, activities would be temporary and undertaken in an industrial setting and therefore it is considered unlikely that these effects would be significant. HGV movements could also affect the tranquillity of areas alongside local transport networks. The severity of these effects in the vicinity of the interim storage facility may vary depending upon the type of facility to be decommissioned. In this respect, it is anticipated that landscape and townscape effects would be greater for decommissioning of a RC storage facility given the relatively large scale of the facility which would serve to increase both the scale and duration of decommissioning activity. .	**-/++**
Option 2: Decommission Brownfield Sites	
Assessment of Effects: Effects on landscape and townscape related to decommissioning activities are expected to be similar to those detailed under Option 1. However, both the scale and duration of the decommissioning phase would be reduced under this option as it is assumed that hardstanding and some infrastructure (e.g. docking facilities and roads) would be retained and, consequently, the severity of effects associated with this stage of the SDP process may be less. In addition, it is assumed that sites would be located within or adjacent to an existing settlement and consequently it is more likely (relative to Option 1) that new visual elements (e.g. temporary ILW packaging facilities, compounds, machinery, cranes and spoil) would be in-keeping with their wider surrounds. However, it is acknowledged that brownfield sites may be sensitively located for example, within the open countryside, within a Conservation Area or in close proximity to sensitive receptors where activities could have a negative effect on landscape/townscape. During decommissioning it is assumed that all buildings and some infrastructure will be removed from SDP sites thereby restoring landscape character to the previous baseline. Depending on the sites taken forward for development and the decommissioning strategy adopted, there is potential for landscape and townscape quality and visual amenity to be enhanced relative to prior to the SDP development. This could be achieved for example through landscape planting to screen the site following completion of decommissioning works. **Technical Options:** As the range of potential effects on this objective are expected to be similar to (or less than) Option 1, the influence of the technical options on their severity is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	

Stage VII: Decommissioning the SDP Facilities Landscape and Townscape	
Summary: Option 2 has been assessed as having a neutral effect on this objective in the long term as restoration works will restore the site to the brownfield condition found on site prior to development, which is not expected to significantly differ in landscape and townscape character compared to during SDP operations. There is potential for landscape and townscape quality to be enhanced (e.g. though landscape planting to screen the site following completion of works). However, this is dependent on the sites taken forward for development and the decommissioning strategy adopted. There is a potential for decommissioning activities may have a short term negative effect on landscape and townscape primarily due to the introduction of new visual elements (e.g. temporary ILW packaging facilities, compounds, machinery, cranes and spoil), which may contrast with the existing landscape and/or interrupt or result in the loss of views. However, activities would be temporary and undertaken in an industrial setting and therefore it is considered unlikely that these effects would be significant. In addition, as sites would be located within or adjacent to an existing settlement under this option, new visual elements are more likely (relative to Option 1) to be in-keeping with their wider surrounds although it is acknowledged that brownfield sites may be sensitively located. HGV movements could also affect the tranquillity of areas alongside local transport networks. It is anticipated that landscape and townscape effects would be potentially greater for decommissioning of a RC interim storage facility given the relatively large scale of the facility which would serve to increase both the scale and duration of decommissioning activity. However, any adverse effects would only be temporary and are therefore unlikely to be significant.	**0**
Option 3: Decommission Licensed/Authorised Sites	
Assessment of Effects: Effects on landscape and townscape related to decommissioning activities under Option 3 are expected to be similar to those detailed under Options 1 and 2. There is potential for any adverse effects associated with this option to be further reduced relative to Option 2 reflecting the fact that SDP sites would continue to be Licensed/Authorised and therefore the pre-existing infrastructure/facilities may not require demolition. There may also be potential to retain some of the new ancillary facilities and any additional infrastructure constructed during Stages 1 and 2 or to refit the facilities for the dismantling of further submarines thereby reducing the scale of decommissioning activities (and potential for adverse landscape effects) further. However, this is dependent on the decommissioning strategy implemented and the specific requirements of any future uses and is not within the scope of this assessment. Similar to Option 2, there may also be an opportunity to enhance landscape and townscape quality and visual amenity relative to the existing baseline for example, through landscape planting to screen the site following completion of decommissioning works. **Technical Options:** As the range of potential effects on this objective are expected to be similar to (or less than) Option 1, the influence of the technical options on their severity is also expected to be similar. **Proposed Mitigation / Enhancements Measures:** • No additional measures beyond those proposed for Option 1.	
Summary: As buildings and infrastructure are removed, it is expected that landscape and townscape character will be returned to the existing baseline although there is potential for landscape and townscape quality and visual amenity to be enhanced (e.g. though landscape planting to screen the site following completion of works). Effects on landscape and townscape related to decommissioning activities under Option 3 are expected to be similar to those	**0**

Stage VII: Decommissioning the SDP Facilities Landscape and Townscape	
detailed under Options 1 and 2. There is potential for any adverse effects associated with this option to be further reduced relative to Option 2 given the reduced scale of decommissioning work required.	

14.8 Integrated Options Assessment

This section presents the findings of the assessment of the SDP integrated options on the landscape and townscape objective. **Box 14.2** provides a summary of the options that have been assessed.

Box 14.2 Integrated Options

The integrated options are considered to be those credible combinations of the following:

- **Technical dismantling options**: Comparison of alternative technical approaches to the initial dismantling of submarines (whether RC, RPV or PW).
- **Initial Dismantling Site(s):** Comparison of different sites for initial submarine dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).
- **Generic ILW Storage Site(s) / Solution**: Comparison of generic categories of sites to store the Intermediate Level Waste (ILW) arising from initial dismantling (including consideration of Devonport Dockyard/HMNB Devonport and Rosyth Dockyard).

The combination of these options and subsequent grouping has resulted in the following 6 broad options:

- **Option 0**: Do Minimum (Continued afloat storage)
- **Option 1**: RC separation with storage at the point of waste regeneration
- **Option 2**: RPV removal with storage at point of waste generation
- **Options 3/4**: RPV removal with storage at remote site
- **Option 5**: Early dismantling with storage as packaged waste at the point of waste generation
- **Options 6/8**: Early dismantling with storage as packaged waste at a remote site

Each option presented above has been designated with a variant which reflects the location of dismantling and interim storage sites as follows:

- **"D"** (e.g. Variant 2D) indicate that the submarine will be dismantled at Devonport
- **"R"** (e.g. Variant 2R) indicate that the submarine will be dismantled out at Rosyth Dockyard
- **"B"** (e.g. Variant 2B) indicates that the submarine will be dismantled at both Devonport Dockyard/HMNB Devonport and Rosyth Dockyard. Subsequent operations like interim storage and size reduction may not be performed at either Devonport Dockyard/HMNB Devonport or Rosyth Dockyard.

Each of the options described in Box 14.2 are considered in-turn below.

Option 1: RC separation with storage at point of waste generation

Assessment Criteria	Score 1D	Score 1R	Score 1B	Commentary
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity.	-/--	-/--	-/--	<u>**Potential Effects**</u> In the case of these options, SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards. No loss of key landscape elements or features is therefore anticipated. The Devonport and Rosyth dockyards are not located within a designated area of landscape value. However, there is the potential for construction activities, in particular the introduction of new buildings and structures, to impact on the character of the surrounding landscape and townscape, including protected/designated landscapes and townscapes. Construction activities may also have a negative visual effect through the introduction of new elements into existing views or the loss of views, particularly the introduction of tall elements such as dockside cranes and the interim storage facility for the RC *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The surface facilities and infrastructure would remain on site for the duration of the SDP, and therefore any negative landscape and visual effects associated with the physical presence of these would remain throughout the SDP. Lighting would be required throughout the SDP (machinery, office/facilities and security lighting), contributing to light pollution. Although most construction works could be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution. It is expected that submarines will be wet towed into the dockyard. In the unlikely event that submarines are transported using heavy lift vessel there is a potential that any channel modification and dredging, and any subsequent heavy lifting operations, will have a very temporary visual impact *(refer to impacts specific to the Devonport and Rosyth dockyards).* No effects on public access to open spaces or the countryside are anticipated, as the Devonport and Rosyth dockyards are not accessible to the public and do not contain any open spaces. Of the technical options, as the scale of development required for the RC option would be greater than the other options, with the RC option requiring a new interim storage area with a footprint of 11,600m^2, the landscape and visual impact of this option would be greater and could be significant. In the case of the RC option, construction of SDP facilities would be phased, with initial construction comprising construction of facilities for dismantling and interim storage only. Construction of facilities for segregation and size reduction would not take place until the interim storage period is nearing completion. This would mean that construction would be spread over two phases rather than one period. The scale of development required at the intial dismantling phase for the RC option would be less than that of the PW option (which requires all facilities to be constructed prior to initial dismantling). As a result, the extent and duration of construction activities are expected to be less such that the potential for adverse effects on landscape and townscape may be reduced in the short term. However, further adverse effects may be generated in the longer term during construction of site elements required to support segregation/size reduction. <u>Devonport Dockyard</u> Devonport dockyard is a well established dockyard, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is situated on low-lying land along the eastern bank of the Hamoaze estuary, with higher land surrounding. The dockyard is an industrial site, with many historic buildings particularly in South Yard, and modern, large buildings and structures supporting current activities. The area surrounding the Devonport dockyard predominantly comprises commercial and

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. The town of Torpoint in the Rame Peninsula of south-east Cornwall is situated to the south-west of Devonport dockyard across the Hamoaze estuary.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	-/--	-/--	-/--	Land uses on the Rame Peninsula surrounding Torpoint comprises farmland, woodland and green space with interspersed isolated properties, country estates and small settlements, with some commercial and industrial uses. To the north-west of Devonport dockyard across the Hamoaze estuary is the town of Saltash. There are wide coves of mudflat, particularly on the western side of the Hamoaze estuary. Devonport dockyard is not located within a designated area of landscape value. However, the northern part of the Rame Peninsula across the Hamoaze estuary from Devonport dockyard (approx. 1km to the west/north-west of Devonport dockyard at its closest point) is part of the Tamar Valley Area of Outstanding Natural Beauty (AONB). In addition, Rame Head on the south part of the Rame Peninsula (approx. 2.9km to the south of Devonport dockyard at its closest point) is part of the Cornwall AONB. Devonport Conservation Area and Devonport Registered Park & Garden are located immediately south of Devonport dockyard, and to the east of Devonport Conservation Area is Stonehouse Peninsula Conservation Area. The Grade II* Antony Registered Park and Garden is located approx. 1.1km to the west/north-west of the dockyard across the Hamoaze Estuary (the eastern end of the Registered Park and Garden fronts on to the west bank of the estuary across the channel from Devonport dockyard). The Rame Head and South Devon Heritage Coasts are 5km and 9.5km south and south-east of the dockyard respectively. There is the potential for SDP activities, particularly the introduction of new buildings and structures (and in particularly the interim store), to impact on landscape character and visual amenity, particularly the landscape character of the Tamar Valley AONB to the west/north-west of the dockyard which potentially has views into the dockyard, and the setting and character of the Devonport Conservation Area and Devonport Registered Park & Garden immediately south and Anthony Registered Park & Garden to the west, from which tall buildings and structures within the dockyard may be visible. Taking account of the location of Devonport dockyard on low lying land in a built up area, and given the scale and nature of the development required for the interim storage facility, which whilst in keeping with the existing dockyard facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for the SDP), would have a negative impacts on landscape character and setting (and could be significant). Submarines are likely to be towed to Devonport dockyard for dismantling such that dredging is unlikely to be required for the movement of submarines. In the case of this option, following RC removal the two separated fore and aft hull sections would require transportation to the commercial ship recycling facility. Submarine sections can be transported in a variety of ways including heavy lift vessel, submersible barge or tow (following welding to ensure that they are watertight). Should submarines or fore and aft sections be transported by heavy lift vessel (which is unlikely to be the preferred method) there is potential for any channel modification and dredging works to have a negative visual impact from the introduction of large dredging vessels, typically with tall deck cranes and structures, which may operate on a 24hr basis. Transportation of submarines or fore and aft sections by heavy lift vessel, involving the transfer of each submarine/section on to a large heavy lift submersible ship/barge within the estuary channel could also have a negative visual impact (such a lift operation could take 2 days per submarine and it is estimated that each move will take 4 days). However, any such impacts would be temporary, lasting only for the duration of the channel modification/dredging and heavy lift operations. Taking account of the number of submarine movements required, estimated to be one submarine movement per year, any visual impact from submarine transportation is

Assessment Criteria	Score			Commentary
	1D	1R	1B	
				anticipated to be negligible. Rosyth Dockyard Devonport dockyard is a well established dockyard, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is situated on the eastern bank of the Firth of Forth estuary. The topography of the dockyard is flat and low lying. The immediate area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing to the north-east, and agricultural land to the west, north and east. The town of Rosyth is situated to the north-east of the dockyard, and the town of Limekilns is situated approx. 1km to the west along the coastline.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	-/--	-/--	-/--	To the south, the landscape is dominated by the Firth of Forth estuary. Land uses on the western bank of the Firth of Forth estuary to the south of Rosyth dockyard (approx. 3km from the dockyard) predominantly comprises greenspace and woodland associated with the Hopetoun House estate (a historic stately home within 6,500 acres of grounds). The towns of Inverkeithing and Queensferry are situated approx.2.6km to the north-east and approx. 4km to the south-east of Rosyth dockyard on the eastern and western banks of the Firth of Forth estuary respectively, connected by the Forth Road Bridge. Rosyth dockyard is not located within a designated area of landscape value. However, land to the north of the town of Limekilns to the north-west of Rosyth dockyard falls within the Broomhall/Belleknowes Area of Great Landscape Value (AGLV), which incorporates Limekilns and Charlestown, and runs as far north as the edge of Dunfermline. The landscape is mixed agricultural land and the designation is due to be replaced by a Candidate Special Landscape Area, which will extend the current AGLV boundary to the north and east as part of an ongoing review process. In addition, on the western shore of the Firth of Forth estuary approx. 3km to the south of Rosyth dockyard, is the Forth Shore AGLV, which comprises the managed grounds of the Hopetoun Estate, including the shoreline between Queensferry and Blackness. The Hopetoun Estate is also a Registered Historic Garden & Designed Landscape. There are also several Conservation Areas and AGLVs in the wider surrounding area of Rosyth dockyard. There is the potential for SDP activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity, particularly the landscape character and setting of the Forth Shore AGLV to the south of Rosyth dockyard which potentially has views into the dockyard. Taking account of the location of Rosyth dockyard on low lying land in a built up area, and given the scale and nature of the development required (particularly the interim storage facility), which whilst in keeping with the existing dockyard facilities and activities would have a adverse impacts on landscape character and setting (and which could be significant). Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. In addition, there is sufficient water depth in key locations on the Forth and therefore conduct of a heavy lift operation (if required) should be possible.
N. Landscape and Townscape Protect and enhance landscape and townscape quality	-/--	-/--	-/--	**<u>Comparison of the Options</u>** There is the potential for SDP activities to impact on landscape character and visual amenity at both the Devonport and Rosyth dockyards. Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the

Assessment Criteria	Score			Commentary
	1D	1R	1B	
and visual amenity. *(continued)*				function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. However, assuming that new facilities would be constructed within the nuclear licensed site of the dockyards, with construction of new ILW storage areas and dockside cranes required at both dockyards (which are anticipated to be the most visually intrusive structures) there is not anticipated to be any significant difference in landscape and visual impact between the two dockyards. Taking account of the location of the dockyards on low lying land in a built up area, and given the scale and nature of the development required, adverse impacts on landscape character and setting are anticipated (which could be significant due to the size of the interim storage facility). If heavy lift operations are required, channel modification and dredging would be required at Devonport dockyard, with the potential for additional visual impacts when compared to Rosyth dockyard from the introduction of large dredging vessels in the estuary channel, typically with tall deck cranes and structures, which may operate on a 24hr basis. In the case of Rosyth dockyard, no channel modification or dredging would be required. <u>Combination Option</u> If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both dockyards would enable faster dismantling of submarines, reducing the timescale of any potential landscape and visual impacts associated with SDP activities. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. Overall, scale of potential effect of Option 1B could be greater than that of Options 1D and 1R due to the requirement to provide SDP facilities at both dockyards, resulting in the introduction of new permanent structures at both dockyards.

Option 2: RPV removal with storage at point of waste generation

Assessment Criteria	Score			Commentary
	2D	2R	2B	
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity.	0/-	0/-	0/-	**Potential Effects** In the case of these options, SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards. No loss of key landscape elements or features is therefore anticipated. The Devonport and Rosyth dockyards are not located within a designated area of landscape value. However, there is the potential for construction activities, in particular the introduction of new buildings and structures, to impact on the character of the surrounding landscape and townscape, including protected/designated landscapes and townscapes. Construction activities may also have a negative visual effect through the introduction of new elements into existing views or the loss of views, particularly the introduction of tall elements such as dockside cranes and the interim storage facility for the RC *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The surface facilities and infrastructure would remain on site for the duration of the SDP, and therefore any negative landscape and visual effects associated with the physical presence of these would remain throughout the SDP. Lighting would be required throughout the SDP (machinery, office/facilities and security lighting), contributing to light pollution. Although most construction works could be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution. It is expected that submarines will be wet towed into the dockyard No effects on public access to open spaces or the countryside are anticipated, as the Devonport and Rosyth dockyards are not accessible to the public and do not contain any open spaces. Of the technical options, as the scale of development required for the RPV option would be less than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2, the landscape and visual impact of this option could be less. In addition, in the case of the RPV option construction of SDP facilities would be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation and size reduction would not take place until the interim storage period is nearing completion. This would mean that construction would be spread over two phases rather than one period. The scale of development required at the intial dismantling phase for the RPV option would be less than that of the PW option (which requires all facilities to be constructed prior to initial dismantling). As a result, the extent and duration of construction activities are expected to be less such that the potential for adverse effects on landscape and townscape may be reduced in the short term. However, further adverse effects may be generated in the longer term during construction of site elements required to support segregation/size reduction. Devonport Dockyard Devonport dockyard is a well established dockyard, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is situated on low-lying land along the eastern bank of the Hamoaze estuary, with higher land surrounding. The dockyard is an industrial site, with many historic buildings particularly in South Yard, and modern, large buildings and structures supporting current activities. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. The town of Torpoint in the Rame Peninsula of south-east Cornwall is situated to the south-west of Devonport dockyard across the Hamoaze estuary.
N. Landscape and Townscape Protect and enhance landscape and	0/-	0/-	0/-	Land uses on the Rame Peninsula surrounding Torpoint comprises farmland, woodland and green space with interspersed isolated properties, country estates and small settlements, with some commercial and industrial uses. To the north-west of Devonport dockyard across the Hamoaze estuary is the town of Saltash. There are wide coves of mudflat, particularly on the western side of the Hamoaze estuary.

Assessment Criteria	Score			Commentary
	2D	2R	2B	
townscape quality and visual amenity.				Devonport dockyard is not located within a designated area of landscape value. However, the northern part of the Rame Peninsula across the Hamoaze estuary from Devonport dockyard (approx. 1km to the west/north-west of Devonport dockyard at its closest point) is part of the Tamar Valley AONB. In addition, Rame Head on the south part of the Rame Peninsula (approx. 2.9km to the south of Devonport dockyard at its closest point) is part of the Cornwall AONB. Devonport Conservation Area and Devonport Registered Park & Garden are located immediately south of Devonport dockyard, and to the east of Devonport Conservation Area is Stonehouse Peninsula Conservation Area. The Grade II* Antony Registered Park and Garden is located approx. 1.1km to the west/north-west of the dockyard across the Hamoaze Estuary (the eastern end of the Registered Park and Garden fronts on to the west bank of the estuary across the channel from Devonport dockyard). The Rame Head and South Devon Heritage Coasts are 5km and 9.5km south and south-east of the dockyard respectively. There is the potential for SDP activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity, particularly the landscape character of the Tamar Valley AONB to the west/north-west of the dockyard which potentially has views into the dockyard, and the setting and character of the Devonport Conservation Area and Devonport Registered Park & Garden immediately south and Anthony Registered Park & Garden to the west, from which tall buildings and structures within the dockyard may be visible. However, taking account of the location of Devonport dockyard on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for the SDP), no significant adverse impacts on landscape character and setting are anticipated. Submarines are likely to be towed to Devonport dockyard for dismantling such that dredging is unlikely to be required. The visual effects of such movements will be minimal. <u>Rosyth Dockyard</u> Devonport dockyard is a well established dockyard, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is situated on the eastern bank of the Firth of Forth estuary. The topography of the dockyard is flat and low lying. The immediate area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing to the north-east, and agricultural land to the west, north and east. The town of Rosyth is situated to the north-east of the dockyard, and the town of Limekilns is situated approx. 1km to the west of Rosyth dockyard along the coastline.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity.	0/-	0/-	0/-	To the south, the landscape is dominated by the Firth of Forth estuary. Land uses on the western bank of the Firth of Forth estuary to the south of Rosyth dockyard (approx. 3km from the dockyard) predominantly comprises greenspace and woodland associated with the Hopetoun House estate (a historic stately home within 6,500 acres of grounds). The towns of Inverkeithing and Queensferry are situated approx.2.6km to the north-east and approx. 4km to the south-east of Rosyth dockyard on the eastern and western banks of the Firth of Forth estuary respectively, connected by the Forth Road Bridge. Rosyth dockyard is not located within a designated area of landscape value. However, land to the north of the town of Limekilns to the north-west of Rosyth dockyard falls within the Broomhall/Belleknowes AGLV, which incorporates Limekilns and Charlestown, and runs as far north as the edge of Dunfermline. The landscape is mixed agricultural land and the designation is due to be replaced by a Candidate Special Landscape Area, which will extend the current AGLV boundary to the north and east as part of an ongoing review process. In addition, on the western shore of the Firth of Forth estuary approx. 3km to the south of Rosyth dockyard, is the Forth Shore AGLV, which comprises the managed grounds of the Hopetoun Estate, including the shoreline between Queensferry and Blackness. The Hopetoun Estate is also a Registered Historic Garden & Designed Landscape. There are also several Conservation Areas and AGLVs in the wider surrounding area of

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				Rosyth dockyard. There is the potential for SDP activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, which includes numerous buildings and tall structures of a similar nature to those required for the SDP, no significant adverse impacts on landscape character and setting are anticipated. There is the potential for SDP activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity, particularly the landscape character and setting of the Forth Shore AGLV to the south of Rosyth dockyard which potentially has views into the dockyard. However, taking account of the location of Rosyth dockyard on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for the SDP), no significant adverse impacts on landscape character and setting are anticipated. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. The visual effects of such movements will be minimal.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity.	0/-	0/-	0/-	**Comparison of the Options** There is the potential for SDP activities to impact on landscape character and visual amenity at both the Devonport and Rosyth dockyards. Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. However, assuming that new facilities would be constructed within the nuclear licensed site of the dockyards, with construction of new ILW storage areas and dockside cranes required at both dockyards (which are anticipated to be the most visually intrusive structures) there is not anticipated to be any significant difference in landscape and visual impact between the two dockyards. Taking account of the location of the dockyards on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyards facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for the SDP), no significant adverse impacts on landscape character and setting are anticipated. Any subsequent submarine transportation could also have a very short term negative visual impact (such a lift operation could take 2 days per submarine and it is estimated that each move will take 4 days). In the case of Option 2D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 2R, the 10ubmarines stored afloat at Devonport, along with the 10in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Any visual impact associated with submarine transportation could therefore be greater for Option 2R. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both dockyards would enable faster dismantling of submarines, reducing the timescale of any potential landscape and visual impacts associated with SDP activities. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. Overall, the scale of potential effect of Option 2B could be greater than that of Options 2D and 2R due to the requirement to provide SDP facilities at both dockyards, resulting in the

Assessment Criteria	Score			Commentary
	2D	2R	2B	
				introduction of new permanent structures at both dockyards.

Options 3/4: RPV removal with storage at remote site

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity.	-/?	-/?	-/?	**Potential Effects** Dismantling facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards. No loss of key landscape elements or features is therefore anticipated. Similarly, no effects on public access to open spaces or the countryside are anticipated as a result of dismantling activities, as the Devonport and Rosyth dockyards are not accessible to the public and do not contain any open spaces. The Devonport and Rosyth dockyards are not located within a designated area of landscape value. However, there is the potential for construction activities, in particular the introduction of new buildings and structures, to impact on the character of the surrounding landscape and townscape, including protected/designated landscapes and townscapes. Construction activities may also have a negative visual effect through the introduction of new elements into existing views or the loss of views, particularly the introduction of tall elements such as dockside cranes *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The surface facilities and infrastructure would remain on site for the duration of the SDP, and therefore any negative landscape and visual effects associated with the physical presence of these would remain throughout the SDP. Depending on the location of the remote site for interim storage, there could also be the potential for construction of interim storage and segregation/size reduction facilities to impact on landscape character and visual amenity, particularly the introduction of the interim storage facility of the RPV (estimated to require a footprint of 801m^2). In addition, depending on the land use of the remote site, there could be the potential for loss of key landscape elements/features and potentially open space. At this stage a remote site for interim storage has not been identified and subsequently the potential landscape and visual impact of interim storage and segregation/size reduction activities is uncertain at this stage. The potential for effects would depend on the location of the remote site, existing facilities and infrastructure in the site and its surrounds, and the scale of development required.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	-/?	-/?	-/?	Lighting would be required throughout the SDP (machinery, office/facilities and security lighting), contributing to light pollution. Although most construction works could be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution. It is expected that submarines will be wet towed into the dockyard. Of the technical options, as the scale of development required for the RPV option would be less than the other options, with the RPV option requiring a new interim storage area with a footprint of 801m^2, the landscape and visual impact of this option could be less. In addition, construction would also take place on two different sites, reducing any impacts on cultural heritage from SDP activities as the scale of activity undertaken at the respective sites would be less. In the case of the RPV option construction of SDP facilities would also be phased, with initial construction comprising construction of facilities for initial dismantling and interim storage only. Construction of facilities for segregation and size reduction would not take place until the interim storage period is nearing completion. This would mean that construction would be spread over two phases rather than one period. The scale of development required at the intial dismantling phase for the RPV option would be less than that of the PW option (which requires all facilities to be constructed prior to initial dismantling). As a result, the extent and duration of construction activities are expected to be less such that the potential for adverse effects on landscape and townscape may be reduced in the short term. However, further adverse effects may be generated in the longer term during construction of segregation/size reduction facilities. Devonport Dockyard Devonport dockyard is a well established dockyard, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is situated on low-lying land along the eastern bank of the Hamoaze estuary, with higher land

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				surrounding. The dockyard is an industrial site, with many historic buildings particularly in South Yard, and modern, large buildings and structures supporting current activities. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. The town of Torpoint in the Rame Peninsula of south-east Cornwall is situated to the south-west of Devonport dockyard across the Hamoaze estuary. Land uses on the Rame Peninsula surrounding Torpoint comprises farmland, woodland and green space with interspersed isolated properties, country estates and small settlements, with some commercial and industrial uses. To the north-west of Devonport dockyard across the Hamoaze estuary is the town of Saltash. There are wide coves of mudflat, particularly on the western side of the Hamoaze estuary. Devonport dockyard is not located within a designated area of landscape value. However, the northern part of the Rame Peninsula across the Hamoaze estuary from Devonport dockyard (approx. 1km to the west/north-west of Devonport dockyard at its closest point) is part of the Tamar Valley AONB. In addition, Rame Head on the south part of the Rame Peninsula (approx. 2.9km to the south of Devonport dockyard at its closest point) is part of the Cornwall AONB. Devonport Conservation Area and Devonport Registered Park & Garden are located immediately south of Devonport dockyard, and to the east of Devonport Conservation Area is Stonehouse Peninsula Conservation Area. The Grade II* Antony Registered Park and Garden is located approx. 1.1km to the west/north-west of the dockyard across the Hamoaze Estuary (the eastern end of the Registered Park and Garden fronts on to the west bank of the estuary across the channel from Devonport dockyard). The Rame Head and South Devon Heritage Coasts are 5km and 9.5km south and south-east of the dockyard respectively.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	-/?	-/?	-/?	There is the potential for dismantling activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity, particularly the landscape character of the Tamar Valley AONB to the west/north-west of the dockyard which potentially has views into the dockyard, and the setting and character of the Devonport Conservation Area and Devonport Registered Park & Garden immediately south and Anthony Registered Park & Garden to the west, from which tall buildings and structures within the dockyard may be visible. However, taking account of the location of Devonport dockyard on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for initial dismantling), no significant adverse impacts on landscape character and setting are anticipated. Submarines are likely to be towed to Devonport dockyard for dismantling such that dredging is unlikely to be required. The visual effects of such movements will be minimal. <u>Rosyth Dockyard</u> Devonport dockyard is a well established dockyard, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is situated on the eastern bank of the Firth of Forth estuary. The topography of the dockyard is flat and low lying. The immediate area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing to the north-east, and agricultural land to the west, north and east. The town of Rosyth is situated to the north-east of the dockyard, and the town of Limekilns is situated approx. 1km to the west of Rosyth dockyard along the coastline. To the south, the landscape is dominated by the Firth of Forth estuary. Land uses on the western bank of the Firth of Forth estuary to the south of Rosyth dockyard (approx. 3km from the dockyard) predominantly comprises greenspace and woodland associated with the Hopetoun House estate (a historic stately home within 6,500 acres of grounds). The towns of Inverkeithing and Queensferry are situated approx.2.6km to the north-east and approx. 4km to the south-east of Rosyth dockyard on the eastern and western banks of the

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
				Firth of Forth estuary respectively, connected by the Forth Road Bridge. Rosyth dockyard is not located within a designated area of landscape value. However, land to the north of the town of Limekilns to the north-west of Rosyth dockyard falls within the Broomhall/Belleknowes AGLV, which incorporates Limekilns and Charlestown, and runs as far north as the edge of Dunfermline. The landscape is mixed agricultural land and the designation is due to be replaced by a Candidate Special Landscape Area, which will extend the current AGLV boundary to the north and east as part of an ongoing review process. In addition, on the western shore of the Firth of Forth estuary approx. 3km to the south of Rosyth dockyard, is the Forth Shore AGLV, which comprises the managed grounds of the Hopetoun Estate, including the shoreline between Queensferry and Blackness. The Hopetoun Estate is also a Registered Historic Garden & Designed Landscape. There are also several Conservation Areas and AGLVs in the wider surrounding area of Rosyth dockyard.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	-/?	-/?	-/?	There is the potential for dismantling activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, which includes numerous buildings and tall structures of a similar nature to those required for initial dismantling, no significant adverse impacts on landscape character and setting are anticipated. There is the potential for SDP activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity, particularly the landscape character and setting of the Forth Shore AGLV to the south of Rosyth dockyard which potentially has views into the dockyard. However, taking account of the location of Rosyth dockyard on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for the SDP), no significant adverse impacts on landscape character and setting are anticipated. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. Any visual impact from submarine transportation is anticipated to be negligible. **<u>Comparison of the Options</u>** There is the potential for SDP activities to impact on landscape character and visual amenity at both the Devonport and Rosyth dockyards. Assuming that new facilities would be constructed within the nuclear licensed site of the dockyards, with installation of new dockside cranes required at both dockyards (which are anticipated to be the most visually intrusive structures) there is not anticipated to be any significant difference in landscape and visual impact between the two dockyards. Taking account of the location of the dockyards on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyards facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for initial dismantling), no significant adverse impacts on landscape character and setting are anticipated. Any subsequent submarine transportation could also have a very short term negative visual impact (such a lift operation could take 2 days per submarine and it is estimated that each move will take 4 days). In the case of Option 3/4D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 3/4R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Any visual impact associated with submarine transportation could therefore be greater for Option 3/4R.

Assessment Criteria	Score			Commentary
	3/4D	3/4R	3/4B	
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	-/?	-/?	-/?	At this stage a remote site for interim storage has not been identified and subsequently the potential landscape and visual impact of interim storage and segregation/size reduction activities is uncertain at this stage. The potential for effects would depend on the location of the remote site, the landscape of the site and its surrounds and the proximity of the site to protected/designated landscapes and townscapes. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage. However, it is noted that utilising both dockyards would enable faster dismantling of submarines, reducing the timescale of any potential landscape and visual impacts associated with SDP activities. In the case of the dual site option, transportation of submarines for dismantling could also be avoided if the existing submarines at the dockyards remain at their respective dockyards and all of the in-service submarines are dismantled at Devonport dockyard where they will be defuelled. Overall, the scale of potential effect of Option 3/4B could be greater than that of Options 3/4D and 3/4R due to the requirement to provide SDP facilities at both dockyards, resulting in the introduction of new permanent structures at both dockyards.

Option 5: Early dismantling with storage as packaged waste at the point of waste generation

<table>
<tr><th rowspan="2">Assessment Criteria</th><th colspan="3">Score</th><th rowspan="2">Commentary</th></tr>
<tr><th>5D</th><th>5R</th><th>5B</th></tr>
<tr><td>N. Landscape and Townscape
Protect and enhance landscape and townscape quality and visual amenity.</td><td>0/-</td><td>0/-</td><td>0/-</td><td><u>Potential Effects</u>
In the case of these options, SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards. No loss of key landscape elements or features is therefore anticipated.
The Devonport and Rosyth dockyards are not located within a designated area of landscape value. However, there is the potential for construction activities, in particular the introduction of new buildings and structures, to impact on the character of the surrounding landscape and townscape, including protected/designated landscapes and townscapes.
Construction activities may also have a negative visual effect through the introduction of new elements into existing views or the loss of views, particularly the introduction of tall elements such as dockside cranes and the interim storage facility for the RC (refer to impacts specific to the Devonport and Rosyth dockyards). The surface facilities and infrastructure would remain on site for the duration of the SDP, and therefore any negative landscape and visual effects associated with the physical presence of these would remain throughout the SDP.
Lighting would be required throughout the SDP (machinery, office/facilities and security lighting), contributing to light pollution. Although most construction works could be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution.
It is expected that submarines will be wet towed into the dockyard.
No effects on public access to open spaces or the countryside are anticipated, as the Devonport and Rosyth dockyards are not accessible to the public and do not contain any open spaces.
Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. The potential landscape and visual impact for interim storage construction for the PW option could therefore be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full segregation and size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. The PW option could result in a greater landscape and visual impact in the short term when compared to the RC and RPV options. However, further adverse effects on landscape and townscape would be avoided in the longer term as all SDP facilities would have been constructed.
<u>Devonport Dockyard</u>
Devonport dockyard is a well established dockyard, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is situated on low-lying land along the eastern bank of the Hamoaze estuary, with higher land surrounding. The dockyard is an industrial site, with many historic buildings particularly in South Yard, and modern, large buildings and structures supporting current activities.
The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. The town of Torpoint in the Rame Peninsula of south-east Cornwall is situated to the south-west of Devonport dockyard across the Hamoaze estuary.</td></tr>
<tr><td>N. Landscape and Townscape
Protect and enhance landscape and townscape quality</td><td>0/-</td><td>0/-</td><td>0/-</td><td>Land uses on the Rame Peninsula surrounding Torpoint comprises farmland, woodland and green space with interspersed isolated properties, country estates and small settlements, with some commercial and industrial uses. To the north-west of Devonport dockyard across the Hamoaze estuary is the town of Saltash. There are wide coves of mudflat, particularly on the western side of the Hamoaze estuary.
Devonport dockyard is not located within a designated area of landscape value. However,</td></tr>
</table>

Assessment Criteria	Score			Commentary
	5D	5R	5B	
and visual amenity. *(continued)*				the northern part of the Rame Peninsula across the Hamoaze estuary from Devonport dockyard (approx. 1km to the west/north-west of Devonport dockyard at its closest point) is part of the Tamar Valley AONB. In addition, Rame Head on the south part of the Rame Peninsula (approx. 2.9km to the south of Devonport dockyard at its closest point) is part of the Cornwall AONB. Devonport Conservation Area and Devonport Registered Park & Garden are located immediately south of Devonport dockyard, and to the east of Devonport Conservation Area is Stonehouse Peninsula Conservation Area. The Grade II* Antony Registered Park and Garden is located approx. 1.1km to the west/north-west of the dockyard across the Hamoaze Estuary (the eastern end of the Registered Park and Garden fronts on to the west bank of the estuary across the channel from Devonport dockyard). The Rame Head and South Devon Heritage Coasts are 5km and 9.5km south and south-east of the dockyard respectively. There is the potential for SDP activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity, particularly the landscape character of the Tamar Valley AONB to the west/north-west of the dockyard which potentially has views into the dockyard, and the setting and character of the Devonport Conservation Area and Devonport Registered Park & Garden immediately south and Anthony Registered Park & Garden to the west, from which tall buildings and structures within the dockyard may be visible. However, taking account of the location of Devonport dockyard on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for the SDP), no significant adverse impacts on landscape character and setting are anticipated. Submarines are likely to be towed to Devonport dockyard for dismantling such that dredging is unlikely to be required. Any visual impact from submarine transportation is anticipated to be negligible. <u>Rosyth Dockyard</u> Devonport dockyard is a well established dockyard, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is situated on the eastern bank of the Firth of Forth estuary. The topography of the dockyard is flat and low lying. The immediate area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing to the north-east, and agricultural land to the west, north and east. The town of Rosyth is situated to the north-east of the dockyard, and the town of Limekilns is situated approx. 1km to the west of Rosyth dockyard along the coastline.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	0/-	0/-	0/-	To the south, the landscape is dominated by the Firth of Forth estuary. Land uses on the western bank of the Firth of Forth estuary to the south of Rosyth dockyard (approx. 3km from the dockyard) predominantly comprises greenspace and woodland associated with the Hopetoun House estate (a historic stately home within 6,500 acres of grounds). The towns of Inverkeithing and Queensferry are situated approx.2.6km to the north-east and approx. 4km to the south-east of Rosyth dockyard on the eastern and western banks of the Firth of Forth estuary respectively, connected by the Forth Road Bridge. Rosyth dockyard is not located within a designated area of landscape value. However, land to the north of the town of Limekilns to the north-west of Rosyth dockyard falls within the Broomhall/Belleknowes AGLV, which incorporates Limekilns and Charlestown, and runs as far north as the edge of Dunfermline. The landscape is mixed agricultural land and the designation is due to be replaced by a Candidate Special Landscape Area, which will extend the current AGLV boundary to the north and east as part of an ongoing review. In addition, on the western shore of the Firth of Forth estuary approx. 3km to the south of Rosyth dockyard, is the Forth Shore AGLV, which comprises the managed grounds of the Hopetoun Estate, including the shoreline between Queensferry and Blackness. The Hopetoun Estate is also a Registered Historic Garden & Designed Landscape. There are also several Conservation Areas and AGLVs in the wider surrounding area of

Assessment Criteria	Score			Commentary
	5D	5R	5B	
				Rosyth dockyard. There is the potential for SDP activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, which includes numerous buildings and tall structures of a similar nature to those required for the SDP, no significant adverse impacts on landscape character and setting are anticipated. There is the potential for SDP activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity, particularly the landscape character and setting of the Forth Shore AGLV to the south of Rosyth dockyard which potentially has views into the dockyard. However, taking account of the location of Rosyth dockyard on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for the SDP), no significant adverse impacts on landscape character and setting are anticipated. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. Any visual impact from submarine transportation is anticipated to be negligible. **Comparison of the Options** There is the potential for SDP activities to impact on landscape character and visual amenity at both the Devonport and Rosyth dockyards.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	0/-	0/-	0/-	Assuming that the Devonport and Rosyth dockyards are similarly equipped for SDP activities, albeit Devonport dockyard is less well equipped to undertake additional LLW processing and further work would be required at Devonport dockyard to optimise the function of existing waste management facilities, the level of modification to existing facilities and new development required could be greater at Devonport dockyard. However, assuming that new facilities would be constructed within the nuclear licensed site of the dockyards, with construction of new interim storage areas and dockside cranes required at both dockyards (which are anticipated to be the most visually intrusive structures) there is not anticipated to be any significant difference in landscape and visual impact between the two dockyards. Taking account of the location of the dockyards on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyards facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for the SDP), no significant adverse impacts on landscape character and setting are anticipated. Any subsequent submarine transportation by could also have a very short term negative visual impact (such a lift operation could take 2 days per submarine and it is estimated that each move will take 4 days). In the case of Option 5D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 5R, the 10 submarines stored afloat at Devonport, along with the 10 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Any visual impact associated with submarine transportation could therefore be greater for Option 5R. Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage.

Option 6/8: Early dismantling with storage as packaged waste at a remote site

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity.	0/-/?	0/-/?	0/-/?	**<u>Potential Effects</u>** SDP facilities and infrastructure would be located within the nuclear licensed site at the Devonport and Rosyth dockyards. No loss of key landscape elements or features is therefore anticipated. Similarly, no effects on public access to open spaces or the countryside are anticipated as a result of dismantling activities, as the Devonport and Rosyth dockyards are not accessible to the public and do not contain any open spaces. The Devonport and Rosyth dockyards are not located within a designated area of landscape value. However, there is the potential for construction activities, in particular the introduction of new buildings and structures, to impact on the character of the surrounding landscape and townscape, including protected/designated landscapes and townscapes. Construction activities may also have a negative visual effect through the introduction of new elements into existing views or the loss of views, particularly the introduction of tall elements such as dockside cranes *(refer to impacts specific to the Devonport and Rosyth dockyards)*. The surface facilities and infrastructure would remain on site for the duration of the SDP, and therefore any negative landscape and visual effects associated with the physical presence of these would remain throughout the SDP. Depending on the location of the remote site for interim storage, there could also be the potential for construction of interim storage facilities (estimated to require a footprint of 801m^2)to impact on landscape character and visual amenity. In addition, depending on the land use of the remote site, there could be the potential for loss of key landscape elements/features and potentially open space. At this stage a remote site for interim storage has not been identified and subsequently the potential landscape and visual impact of interim storage is uncertain at this stage. The potential for effects would depend on the location of the remote site, existing facilities and infrastructure in the site and its surrounds, and the scale of development required. Lighting would be required throughout the SDP (machinery, office/facilities and security lighting), contributing to light pollution. Although most construction works could be limited to agreed hours, it is likely that some lighting for security purposes would continue to be in use throughout the night, although shielded to reduce light pollution. It is expected that submarines will be wet towed into the dockyard
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	0/-/?	0/-/?	0/-/?	Of the technical options, the scale of development required for the PW option would be greater than the RPV option but smaller than the RC option, with the PW option requiring a new interim storage area with a footprint of 1,005m^2. The potential landscape and visual impact for interim storage construction for the PW option could therefore be greater than the RPV option but less than the RC option. However, in the case of the PW option as it involves full segregation and size reduction of the RPV prior to interim storage, it is assumed that all SDP facilities would be constructed prior to removal of the RPV. The PW option could result in a greater landscape and visual impact in the short term when compared to the RC and RPV options. However, further adverse effects on landscape and townscape would be avoided in the longer term as all SDP facilities would have been constructed. <u>Devonport Dockyard</u> Devonport dockyard is a well established dockyard, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is situated on low-lying land along the eastern bank of the Hamoaze estuary, with higher land surrounding. The dockyard is an industrial site, with many historic buildings particularly in South Yard, and modern, large buildings and structures supporting current activities. The area surrounding the Devonport dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with residential housing and community facilities. The town of Torpoint in the Rame Peninsula of south-east Cornwall is situated to the south-west of Devonport dockyard across the Hamoaze estuary. Land uses on the Rame Peninsula surroundingTorpoint comprises farmland, woodland and green space with

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				interspersed isolated properties, country estates and small settlements, with some commercial and industrial uses. To the north-west of Devonport dockyard across the Hamoaze estuary is the town of Saltash. There are wide coves of mudflat, particularly on the western side of the Hamoaze estuary. Devonport dockyard is not located within a designated area of landscape value. However, the northern part of the Rame Peninsula across the Hamoaze estuary from Devonport dockyard (approx. 1km to the west/north-west of Devonport dockyard at its closest point) is part of the Tamar Valley AONB. In addition, Rame Head on the south part of the Rame Peninsula (approx. 2.9km to the south of Devonport dockyard at its closest point) is part of the Cornwall AONB. Devonport Conservation Area and Devonport Registered Park & Garden are located immediately south of Devonport dockyard, and to the east of Devonport Conservation Area is Stonehouse Peninsula Conservation Area. The Grade II* Antony Registered Park and Garden is located approx. 1.1km to the west/north-west of the dockyard across the Hamoaze Estuary (the eastern end of the Registered Park and Garden fronts on to the west bank of the estuary across the channel from Devonport dockyard). The Rame Head and South Devon Heritage Coasts are 5km and 9.5km south and south-east of the dockyard respectively. There is the potential for SDP activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity, particularly the landscape character of the Tamar Valley AONB to the west/north-west of the dockyard which potentially has views into the dockyard, and the setting and character of the Devonport Conservation Area and Devonport Registered Park & Garden immediately south and Anthony Registered Park & Garden to the west, from which tall buildings and structures within the dockyard may be visible. However, taking account of the location of Devonport dockyard on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for initial dismantling), no significant adverse impacts on landscape character and setting are anticipated.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	0/-/?	0/-/?	0/-/?	Submarines are likely to be towed to Devonport dockyard for dismantling such that dredging is unlikely to be required. Any visual impact from submarine transportation is anticipated to be negligible. Rosyth Dockyard Devonport dockyard is a well established dockyard, predominantly comprising buildings, dockyard infrastructure and hardstanding, dry docks and basins. The dockyard is situated on the eastern bank of the Firth of Forth estuary. The topography of the dockyard is flat and low lying. The immediate area surrounding the Rosyth dockyard predominantly comprises commercial and industrial land uses adjacent to the dockyard and along the waterfront, along with some residential housing to the north-east, and agricultural land to the west, north and east. The town of Rosyth is situated to the north-east of the dockyard, and the town of Limekilns is situated approx. 1km to the west of Rosyth dockyard along the coastline. To the south, the landscape is dominated by the Firth of Forth estuary. Land uses on the western bank of the Firth of Forth estuary to the south of Rosyth dockyard (approx. 3km from the dockyard) predominantly comprises greenspace and woodland associated with the Hopetoun House estate (a historic stately home within 6,500 acres of grounds). The towns of Inverkeithing and Queensferry are situated approx.2.6km to the north-east and approx. 4km to the south-east of Rosyth dockyard on the eastern and western banks of the Firth of Forth estuary respectively, connected by the Forth Road Bridge. Rosyth dockyard is not located within a designated area of landscape value. However, land to the north of the town of Limekilns to the north-west of Rosyth dockyard falls within the Broomhall/Belleknowes AGLV, which incorporates Limekilns and Charlestown, and runs as far north as the edge of Dunfermline. The landscape is mixed agricultural land and the designation is due to be replaced by a Candidate Special Landscape Area, which will extend the current AGLV boundary to the north and east as part of an ongoing review process.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
				In addition, on the western shore of the Firth of Forth estuary approx. 3km to the south of Rosyth dockyard, is the Forth Shore AGLV, which comprises the managed grounds of the Hopetoun Estate, including the shoreline between Queensferry and Blackness. The Hopetoun Estate is also a Registered Historic Garden & Designed Landscape. There are also several Conservation Areas and AGLVs in the wider surrounding area of Rosyth dockyard. There is the potential for dismantling activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity. However, given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities, which includes numerous buildings and tall structures of a similar nature to those required for initial dismantling, no significant adverse impacts on landscape character and setting are anticipated.
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	0/-/?	0/-/?	0/-/?	There is the potential for SDP activities, particularly the introduction of new buildings and structures, to impact on landscape character and visual amenity, particularly the landscape character and setting of the Forth Shore AGLV to the south of Rosyth dockyard which potentially has views into the dockyard. However, taking account of the location of Rosyth dockyard on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyard facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for the SDP), no significant adverse impacts on landscape character and setting are anticipated. Based on current known information it is understood that the channel arrangements at Rosyth dockyard would allow for submarines to be towed directly into and out of the dockyard. Any visual impact from submarine transportation is anticipated to be negligible. **Comparison of the Options** There is the potential for SDP activities to impact on landscape character and visual amenity at both the Devonport and Rosyth dockyards. Assuming that new facilities would be constructed within the nuclear licensed site of the dockyards, with installation of new dockside cranes required at both dockyards (which are anticipated to be the most visually intrusive structures) there is not anticipated to be any significant difference in landscape and visual impact between the two dockyards. Taking account of the location of the dockyards on low lying land in a built up area, and given the scale and nature of the development required, which would be in keeping with the existing dockyards facilities and activities (which includes numerous buildings and tall structures of a similar nature to those required for initial dismantling), no significant adverse impacts on landscape character and setting are anticipated. In the unlikely event that heavy lift operations are needed dredging would be required at Devonport dockyard, with the potential for additional visual impacts when compared to Rosyth dockyard from the introduction of large dredging vessels in the estuary channel, typically with tall deck cranes and structures, which may operate on a 24hr basis. In the case of Rosyth dockyard, no channel modification or dredging would be required. Any subsequent submarine transportation could also have a very short term negative visual impact (such a lift operation could take 2 days per submarine and it is estimated that each move will take 4 days). In the case of Option 6/8D, the 7 submarines stored afloat at Rosyth dockyard would require transportation to Devonport dockyard, resulting in 7 submarine transport movements. In the case of Option 6/8R, the 9 submarines stored afloat at Devonport, along with the 11 in-service submarines which will be defuelled at Devonport dockyard, would require transportation to Rosyth dockyard, resulting in 20 submarine transport movements. Any visual impact associated with submarine transportation could therefore be greater for Option 6/8R. At this stage a remote site for interim storage has not been identified and subsequently the potential landscape and visual impact of interim storage is uncertain at this stage. The potential for effects would depend on the location of the remote site, the landscape of the site and its surrounds and the proximity of the site to protected/designated landscapes and townscapes.

Assessment Criteria	Score			Commentary
	6/8D	6/8R	6/8B	
N. Landscape and Townscape Protect and enhance landscape and townscape quality and visual amenity. *(continued)*	0/-/?	0/-/?	0/-/?	Combination Option If both the Devonport and Rosyth dockyards are utilised, the scale of potential effect could differ, depending on the extent of usage of each site. In the case of the PW combination option full duplication of the required dismantling facility would be prohibitively expensive so it is assumed only one facility would be constructed at one of the dockyards in this instance. However, at this stage no assumption can be made about which of the two dockyards would host the size reduction facility. As site usage is unknown, any potential difference in effects largely cannot be determined at this stage.