Department of Energy & Climate Change

The Scottish Government
Riaghaltas na h-Alba

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DOE

UK Strategy for the Management of Solid Low Level Waste from the Nuclear Industry

Strategic Environmental Assessment Environment and Sustainability Report

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Appendix A – Glossary of technical terms and abbreviations

Term	Description
Alpha radiation	Alpha radiation takes the form of particles (helium nuclei) ejected from some decaying (radioactive) atoms. Alpha particles cause ionisations in biological tissue which may lead to damage. The particles have a very short range in air (typically about 5cm) and if present in materials that are outside the body, they are prevented from causing biological damage by the superficial dead skin cells, but become significant if inhaled or swallowed.
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
BAP	Biodiversity Action Plan
BAT	Best Available Technology (OSPAR) or Best Available Technique (PPC Directive)
Beta radiation	Beta radiation takes the form of particles (electrons) emitted from the nucleus of some decaying (radioactive) atoms. Beta particles cause ionisations in biological tissue which may lead to damage. Most beta particles can pass through the skin and penetrate the body, but a few millimetres of light materials, such as aluminium, will generally shield against them.
BPEO	Best Practicable Environmental Option – a set of procedures adopted that "*emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes for a given set of objectives, the option that provides the most benefits or the least damage to the environment, as a whole, at acceptable cost, in the long term as well as in the short term.*" (Royal Commission on Environmental Pollution, 12th Report, February 1988).
BPM	Best Practicable Means
Bq	Bequerel. Standard international unit of radioactivity equal to one radioactive transformation per second. Low level waste (LLW) and very low level waste (VLLW) are classified according to their radioactive content per unit mass. Multiples of becquerels commonly used in quantifying radioactive waste are: kilobecquerel (kBq) equal to one thousand Bq and megabecquerel (MBq) equal to one million Bq.

Term	Description
CO_2	Carbon dioxide. The most commonly referred to of a number of pollutants known as greenhouse gases. Increasing concentrations of CO_2 in the atmosphere contribute to global climatic change.
CO_2e	Carbon dioxide equivalent. CO_2e is a universal unit of measurement that allows the global warming potential of different greenhouse gases to be compared. Other greenhouses gases such as CH_4 and N_2O are converted to CO_2e.
Contaminated Land	In this report, contaminated land refers to radioactive contaminated land. It is a special case of land that is determined as Contaminated Land under Part 2A of the Environmental Protection Act as it is causing harm or there is a significant possibility of such harm being caused. Harm is defined as "lasting exposure resulting from the after effects of a radiological emergency, part practice or past work activity".
Critical group	The individual members of a population who can realistically be expected to receive the highest dose due to their lifestyle, location and habits. This term is equivalent to the term 'representative person' used by the International Commission on Radiological Protection (ICRP).
Decay chains	These generally refer to the three naturally occurring series of radionuclides, all of which start with a single parent (uranium-238, uranium-235 and thorium-232) each of which decays via a number of radioactive daughters of different half-lives, eventually ending with stable nuclides of lead.
DECC	Department of Energy and Climate Change
Decommissioning	The process whereby a nuclear facility, at the end of its economic life, is taken permanently out of service and its site made available for other purposes.
Defra	Department for the Environment, Food and Rural Affairs
DOENI	Department of the Environment of Northern Ireland
Dose	A general term used as a measure of the dose absorbed by man from radiation, measured in sieverts, and its sub-multiples (millisieverts – mSv - equal to one thousandth of a sievert, or microsieverts, equal to one millionth of a sievert). Radiation dose is received from many sources – of the average annual dose of 2.6 mSv, 85 per cent comes from natural background radiation, 14 per cent from medical sources and the remaining one per cent from miscellaneous man-made sources.
Dose constraint	A level of dose set to restrict future doses that might be received from a practice involving ionising radiation. Dose constraints are less than the legal dose limit and will often differ dependent on the practice being planned.

Term	Description
Dose limit	The value of the effective dose or the equivalent dose to individuals from controlled practices that shall not be exceeded. Dose limits are laid down in UK law. For members of the public the annual dose limit is 1mSv per year. Different dose limits apply to workers.
EA	Environment Agency
EIA	Environmental Impact Assessment
Environmental Safety Case	The collection of arguments, provided by the developer or operator of a facility, that seeks to demonstrate that the required standard of the safety of people and the environment (at present at in the future) is achieved.
ESC	Environmental Safety Case
EU	European Union
European Directive	A European Directive is an item of European Union legislation agreed by the member states, which defines an objective and a set of parameters for its achievement but leaves it to each member state to enact their own domestic legislation to implement the objective. In the UK, this is usually done by enacting Regulations.
Gamma radiation	An electromagnetic radiation similar in some respects to visible light but with higher energy. Gamma rays cause ionisations in biological tissue which may lead to damage. Gamma rays are very penetrating and are attenuated only by shields of dense metal or concrete, perhaps some metres thick, depending on their energy. Their emission from a radionuclide during radioactive decay is usually accompanied by particle emissions (beta or alpha particles).
GDF	Geological Disposal Facility
Half life	The time required for one half of the atoms of a given amount of a particular radionuclide to disintegrate through radioactive decay. Each radionuclide has a unique half-life and half-lives vary from fractions of a second through to many millions of years. The half-life of a radionuclide is therefore of fundamental importance when considering its safe long-term management.
HAW	Higher Activity Waste
Higher Activity Waste	A broad category of radioactive waste generally used to include intermediate level waste (ILW) and high level waste (HLW). Sometimes also held to include some low level waste (LLW) that has characteristics making it unsuitable for near-surface disposal.
HLW	High Level Waste. Radioactive waste above 4 GBq/tonne of alpha or 12 GBq/tonne of beta-gamma activity which releases heat to the extent that it needs to be considered in the design of storage facilities.

Term	Description
HRA	Habitat Regulations Assessment
HSC	Health and Safety Commission
IAEA	International Atomic Energy Authority
ICRP	International Commission on Radiological Protection
ILW	Intermediate Level Waste. Radioactive waste exceeding the upper activity boundaries for LLW (above 4 GBq/tonne of alpha or 12 GBq/tonne of beta-gamma activity), but which does not generate sufficient levels of heat to require it to be factored into the design of disposal facilities.
Irradiated nuclear fuel	Irradiated nuclear fuel means material containing uranium, thorium and/or plutonium isotopes which has been used to maintain a self-sustaining nuclear chain reaction and removed from a nuclear reactor. The characteristics of spent fuel mean that it is managed in a similar way to HLW due to the high activity and heat generating characteristics.
ISO Container	International Organisation for Standardisation Container. A standard sized shipping container which is fully enclosed and 20ft in length with an 8ft x8ft cross-section.
Leachate	Liquid that has seeped through a landfill (waste disposal) site, and which contains a variety of soluble constituents of the waste.
LLW	Low Level Waste. Covers a variety of materials which arise principally as lightly contaminated miscellaneous scrap and redundant equipment from both the nuclear and non-nuclear industries. Organic materials in LLW are mainly in the form of paper towels, clothing and laboratory equipment that have been used in areas where radioactive materials are used — such as hospitals, research establishments and industry. Nuclear industry sites must hold Nuclear Site Licences, issued by the Office of Nuclear Regulation on behalf of the Health and Safety Executive. In addition, they must hold authorisation under the Environmental Permitting Regulations 2010 (EPR10) in England and Wales and the Radioactive Substances Regulation (RSA93) in Scotland to cover the control and management of any emissions from their operations and the management, storage, transfer and disposal of waste, including LLW. Any separate waste management sites accepting LLW must also hold authorisation under EPR10 (in England and Wales) or RSA93 (in Scotland). LLW is defined as radioactive waste that is below 4 Gbq of alpha activity per tonne and below 12 GBq of beta-gamma activity per tonne.
LLWR	Low Level Waste Repository. A facility for the disposal of LLW. The UK's national facility in West Cumbria,

Term	Description
	which has operated since 1959. A smaller facility is now available at Dounreay which will only accept waste from the site at Dounreay and the adjacent Vulcan MOD site.
LNR	Local Nature Reserve
MRF	Metal Recycling Facility
mSv	Millisievert One thousandth of a Sv (sievert), measuring the effect on biological matter (particularly humans). 1 Joule of beta-gamma radiation absorbed per kg of biological tissue has 1 Sv biological effect. 1 Joule of alpha radiation absorbed per kg of biological tissue has 20 Sv effect.
NCA	National Character Area (a unit under which landscape character is defined by Natural England).
NDA	Nuclear Decommissioning Authority The NDA was set up on 1 April 2005, under the Energy Act 2004. It is a non-departmental public body with designated responsibility for managing the liabilities at specific sites. These sites are operated under contract by site licensee companies. The NDA has a statutory requirement under the Energy Act 2004, to publish and consult on its Strategy and Annual Plans, which have to be agreed by the Secretary of State and the Scottish Ministers.
NNR	National Nature Reserve
NO_x/NO_2	Nitrogen oxides / nitrogen dioxide This is a common measure of air quality which can affect health and can react with moisture in the atmosphere to result in a nitric acid solution (acid rain).
Non-nuclear industry	A collective term for a wide range of organisations that handle radioactivity for specific purposes, and/or that create radioactive waste as a result of their operations (such as hospitals, research institutes, etc.), as a consequence of which they are required to be they must hold authorisation under the Environmental Permitting Regulations 2010 (EPR10) in England and Wales and the Radioactive Substances Regulation (RSA93) in Scotland. The non-nuclear industry is distinguished from the nuclear industry by the fact that the latter covers industries involved with nuclear energy, the production of nuclear weapons and large scale radioisotope production. The nuclear industry is subject to additional regulation.
NORM	Naturally Occurring Radioactive Material
ONR	Office of Nuclear Regulation
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic, or OSPAR Convention, combines and updates the earlier Oslo

Term	Description
	and Paris conventions, which respectively covered dumping waste at sea and land-based sources of marine pollution.
PM_{10}	Particulate Matter up to 10 micrometers in diameter. A common measure of air quality. PM10 can affect the respiratory system, contributing to a number of health conditions.
Radioactivity / Radioactive decay	The process by which a radionuclide undergoes transformation with the emission of ionising radiation.
Radioisotope	Different radioactive forms of the same element, for example phosphorous-32 and phosphorous-33 are both radioisotopes of the element phosphorous.
Radionuclide	A generic term which refers to any radioisotope of any element, so for example, tritium (H-3), carbon-14 and caesium-137 are all described as radionuclides.
Ramsar	An internationally designated site under the Ramsar Convention on Wetlands of International Importance.
Regulations	See UK Regulations
RSRL	Research Sites Restoration Ltd.
SAC	Special Area of Conservation
Scheduled Monument	A site listed on a Schedule of archaeological sites and historic monuments of national importance and given legal protection under the Ancient Monuments and Archaeological Areas Act 1979.
SEA	Strategic Environmental Assessment. The type of environmental assessment legally required by EC Directive 2001/42/EC in the preparation of certain plans and programmes. The authority responsible for the plan or programme must prepare an environmental report on its likely significant effects, consult the public on the report and the plan or programme proposals, take the findings into account, and provide information on the plan or programme as finally adopted.
SEPA	Scottish Environment Protection Agency
SM	Scheduled Monument
SO_x	Sulphur oxides. This is a common measure of air quality which can affect health and can react with moisture in the atmosphere to result in a nitric acid solution (acid rain).
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

Term	Description
Sv	Sievert. A unit of radiation dose to living tissue equal to 1 joule per kilogram (which is a measure of energy lost as radiation passes through matter). It is a very large unit, and sub multiples of the Sv are more commonly used, for example, the microsievert (one millionth of a Sv) or the millisievert (one thousandth of a Sv).
UK Regulations	In the UK, certain Acts of Parliament or of the devolved administrations of Scotland, Wales and Northern Ireland give Ministers the authority to enact 'secondary legislation' in the form of Regulations relating to the Act. For instance, the Planning Act 2008 gave the government powers to enact regulations relating to detailed aspects of the working of the Act, including the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009; while the powers to enact the Air Quality Standards Regulations 2010 derive from the European Communities Act 1972.
VLLW	Very Low Level Waste. Covers waste with very low concentrations of radioactivity. It arises from a variety of sources, including hospitals and the wider non-nuclear industry. Because VLLW contains little total radioactivity, it has been safely treated by various means, such as disposal with municipal and general commercial and industrial waste directly at landfill sites or indirectly after incineration. Its formal definition is: (a) in the case of low volumes ('dustbin loads') of VLLW "Radioactive waste which can be safely disposed of to an unspecified destination with municipal, commercial or industrial waste ("dustbin" disposal), each 0.1m3 of waste containing less than 400 kilobecquerels (kBq) of total activity or single items containing less than 40 kBq of total activity. For wastes containing carbon-14 or hydrogen-3 (tritium): (i) in each 0.1m3, the activity limit is 4,000 kBq for carbon-14 and hydrogen-3 (tritium) taken together (ii) for any single item, the activity limit is 400 kBq for carbon-14 and hydrogen-3 (tritium) taken together Controls on disposal of this material, after removal from the premises where the wastes arose, are not necessary. (b) in the case of high volumes of VLLW "Radioactive waste with maximum concentrations of four megabecquerels per tonne (MBq/te) of total activity which can be disposed of to specified landfill sites. For waste containing hydrogen-3 (tritium), the concentration limit for tritium is 40MBq/te. Controls on disposal of this material, after removal from the premises where the wastes arose, will be necessary in a manner specified by the environmental regulators".
VOC	Volatile organic compounds.

Appendix B – Radionuclides and health risk

Introduction

Radioactivity is the property of unstable atoms to undergo transformation with the emission of radiation. An amount of radioactivity is quantified in becquerels (Bq), usually as Bq per unit mass (in the case of solid waste, as Bq per gram, or per tonne). The Bq is equal to one radioactive transformation per second. Multiples of the Bq are commonly used, e.g. kilobecquerels (kBq, equal to one thousand Bq), megabecquerels (MBq, equal to one million Bq) and gigabecquerels (GBq, equal to one thousand million Bq).

Radioactive atoms (called radionuclides or radioisotopes) occur both naturally and artificially — some (particularly those that are naturally occurring) are part of long decay chains (for example, isotopes of uranium and radium), but all eventually decay to non-radioactive atoms. The rate of decay is unique to each radionuclide and is called the radioactive half-life — it is the time required for one half of the atoms of a given amount of a particular radionuclide to disintegrate. Half-lives vary from fractions of a second through to many millions of years. The existence of naturally occurring radionuclides of extremely long half-lives, together with decay chains, means that virtually all material on the earth is radioactive to some extent. Natural radioactivity is also created by processes in the upper atmosphere.

The type of radiation emitted by radionuclides (mainly alpha or beta particles and gamma rays) is called ionising radiation because it removes electrons from atoms, leaving them unstable. Ionising radiation loses energy as it passes through matter, and when it interacts with living tissue, the ionisation it causes may lead to changed or damaged cells. A radiation dose is defined as the energy lost by the radiation per unit mass of material through which it passes. The unit of dose is the gray (Gy) but when dose to living tissue is involved, the unit sievert (Sv) is used. The Sv is a very large amount of radiation dose, and so sub multiples of the Sv are more commonly used, for example microsieverts (µSv, equal to one millionth of a sievert) or millisieverts (mSv, equal to one thousandth of a sievert). People are exposed to radiation simply as a consequence of living in a naturally radioactive world — the average dose from natural sources of radioactivity to members of the public in the UK is 2.2mSv (i.e. 2,200 µSv) per year. However, the property of radioactivity is also used to diagnose medical conditions (with radioactive tracers) and treat disease (by killing malignant cells). It is also used to carry out research, and these activities usually create wastes containing small quantities of radioactivity that require disposal.

Exposure of the UK population to man-made ionising radiation from medical and industrial activity is closely controlled and the estimation of all exposures, whether from natural or man-made radioactive sources, is undertaken by Public Health England. These estimates show that, on average, doses from industrial activity plus weapons fallout are a very small part of the total (less than 1%), doses from medical practices are greater (about 16%) and the remainder (about 84%) comes from natural sources. Similar figures are seen in other developed countries.

Radiation and Health Risk

Investigation into the effects of radiation on humans has been considerable and spans at least 60 years, covering actual exposures of people to natural sources of radiation (e.g. uranium

miners) and artificial sources (e.g. the Japanese atomic bomb survivors, people treated with radiation for various medical conditions and more recently, large studies of the health of radiation workers).

The long-term effects of these real-life human exposures have been considered alongside a vast number of animal and cell experiments. The bulk of evidence points to a linear relationship between exposure and effect (that is, the greater the exposure, the greater the effect). The potential damage from an absorbed dose depends on the type of radiation and the sensitivity of different tissues and organs.

Beyond certain thresholds, radiation can impair the functioning of tissues and/or organs and can produce acute effects such as skin redness, hair loss, radiation burns, or acute radiation syndrome. These effects are more severe at higher doses and higher dose rates. For instance, the dose threshold for acute radiation syndrome is about 1 Sv (1000 mSv).

If the dose is low or delivered over a long period of time (low dose rate), there is greater likelihood for damaged cells to successfully repair themselves. However, long-term effects may still occur if the cell damage is repaired but incorporates errors, transforming an irradiated cell that still retains its capacity for cell division. This transformation may lead to cancer after years or even decades have passed. Effects of this type will not always occur, but their likelihood is proportional to the radiation dose. This risk is higher for children and adolescents, as they are significantly more sensitive to radiation exposure than adults.

Principles of radiation protection

In the UK, radiation exposure that is imposed upon the public over and above natural background is subject to regulation, based upon European standards and international recommendations on radiological protection.

The systems of radiation protection used in many countries of the world, including the UK, are based on the recommendations of the International Commission for Radiological Protection (ICRP). ICRP is a non-governmental scientific organisation which publishes recommendations for protection against ionising radiation. ICRP's recommendations have been incorporated into European Law through Council Directive 2013/59/Euratom, laying down basic safety standards for the protection of the health of workers and the general public against the dangers from ionising radiation. This Directive incorporates the latest recommendations from ICRP published in 2007 and harmonises the EU regime with the Basic Safety standards of the International Atomic Energy’s Agency (IAEA). The UK government has to implement the Directive into UK law by 6 February 2018. The superseded Directive was translated into UK law, principally through the Ionising Radiations Regulations 1999. Despite the update the basic principles of radiological protection are unchanged, and are:

- Justification: any decision that alters the radiation exposure situation should do more good than harm;
- Optimisation of protection: the likelihood of incurring exposure, the number of people exposed, and the magnitude of their individual doses should all be kept as low as reasonably achievable, taking into account economic and societal factors;
- Dose limitation: the total dose to any individual from regulated sources in planned exposure situations other than medical exposure of patients should not exceed the appropriate limits recommended by the Commission.

It should be noted that justification principle relates to the practice giving rise to the waste, and not to subsequent waste management. However, both of the other two principles, optimisation of protection and dose limitation, do apply directly to waste management.

Public Health England is an executive agency of the Department of Health and has a statutory function of providing radiological protection advice in the UK (but it is not a regulator). A fundamental aspect of this work is to issue advice to Government on the implementation of ICRP recommendations in the UK. The Health and Safety Executive (HSE) is the main public body which regulates work that causes or could cause radiation exposure of workers, the public or both.

For further information on radioactivity and radiation, see https://www.gov.uk/health-protection/radiation or http://www.hse.gov.uk/radiation/.

Appendix C: Review of plans, programmes and policies

Introduction

This appendix presents a review of international, European and national plans, programmes and policies considered relevant to the management of solid low level radioactive waste from the nuclear industry.

The first part of this appendix outlines the main objectives and targets identified from the plans programmes and policies considered in the review, on a thematic basis rather than a document-by-document basis. A numbered list of the plans, programmes and strategies referred to is given in the second part of the appendix, and the two parts are linked via the right-hand column of the table below.

Appendix C Part 1: Relevant objectives and targets found in plans and policies

Objectives and Targets	Link to relevant plan, programme or strategy
Air Quality (Relevant to Environment and sustainability objective 1)	
Action to manage and improve air quality is largely driven by European legislation. The *Ambient Air Quality Directive (2008/50/EC)* sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health such as particulate matter and nitrogen dioxide. The directive became law in the UK through the *Air Quality Standards Regulations 2010*, and equivalent regulations in Wales, Scotland and Northern Ireland.	12, 24, 25, 44, 120, 121, 122, 123
Separate legislation exists for emissions of air pollutants, with the main legislation being the *UNECE Gothenburg Protocol* which sets national emission limits (ceilings) for sulphur dioxide (SO_2), oxides of nitrogen (NO_x), ammonia (NH_3) and volatile organic compounds (VOCs). Similar ceilings have also been set in European law under the *National Emission Ceilings Directive (2001/81/EC)*, which was subsequently made into UK law as the *National Emission Ceilings Regulations 2002*.	12, 29, 69
The *Air Quality Strategy for England, Scotland, Wales and Northern Ireland* sets out air quality objectives and policy options to further improve air quality in the UK. As well as direct benefits to public health, these options are intended to provide important benefits to quality of life and help to protect our environment. *Part IV of the Environment Act 1995* and *Part II of the Environment (Northern Ireland) Order*	55, 60, 75, 84, 103, 125, 133, 153

Objectives and Targets	Link to relevant plan, programme or strategy
2002 requires local authorities in the UK to review air quality in their area and designate air quality management areas if improvements are necessary.	
Renewable Energy (Relevant to Environment and sustainability objective 2)	
The EU is committed to providing 20% of energy from renewable sources by 2020 and a mandatory 10% minimum target should be achieved by all Member States for the share of biofuels in transport petrol and diesel consumption. The UK is legally committed to meeting 15% of the UK's energy demand by renewable sources by 2020 (this can be further broken down into 30% electricity; 12% heat; and 10% transport fuels). In Northern Ireland a more stringent target of 40% renewable electricity by 2020 has been set. The Scottish Government has set a target to source 30% of energy demand from renewables by 2020 including 100% electricity, 11% heat and 10% transport. Increasing the amount of energy produced from low-carbon technologies such as renewable and nuclear will help the UK to: • Ensure the UK has a secure supply of energy; • Reduce greenhouse gas emissions to slow down climate change; and • Stimulate investment in new jobs and businesses.	41, 84, 86, 104, 118, 133, 137, 159, 161
Climate Change and Emissions of Greenhouse Gases (Relevant to Environment and sustainability objectives 2 and 10)	
In 1997, under the *Kyoto Protocol*, developed countries agreed to reduce their collective emissions of greenhouse gasses by 5.2% from 1990 levels by 2012. The Doha amendment adds a second commitment period, in which parties must reduce emissions by at least 18% below 1990 levels between 2013 and 2020.	11
Other international objectives include: • Eliminate or reduce the release of POPs into the environment; • Set ceilings for emissions of ammonia, oxides of nitrogen, sulphur dioxide and volatile organic compounds for EC member states; and • Set a target of 6% reduction in the lifecycle of greenhouse gas emissions from fuels by 2020.	7, 13, 29, 34, 42
In 2008 the UK established the world's first legally binding climate change target. The latest UK policy aims to reduce the UK's greenhouse gas emissions by at least 80% (from the 1990 baseline) by 2050 by moving to a more energy efficient, low-carbon economy. This will help the UK become less reliant on imported fossil fuels. In 2009, Scotland committed to a 42% reduction in emissions by 2020 and annual reductions between 2010 and 2050. In Wales, the Welsh Government aims to cut greenhouse gas emissions by 3% per year in areas of devolved competence. The Northern Ireland Executive has committed to a reduction in greenhouse gas emissions	84, 90, 96, 99, 108, 141, 155, 159

Objectives and Targets	Link to relevant plan, programme or strategy
by at least 35% on 1990 levels by 2025.	
Biodiversity, Flora and Fauna (Relevant to Environment and sustainability objective 3)	
The EU agreed to an ambitious conservation plan to protect global biodiversity. The EU vision for biodiversity is: By 2050, EU biodiversity and the ecosystem services it provides – its natural capital – are protected, valued and appropriately restored for biodiversity's intrinsic value and for their essential contribution to human wellbeing and economic prosperity, and so that catastrophic changes caused by the loss of biodiversity are avoided. Halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restore them insofar as is feasible, while stepping up the EU contribution to averting global biodiversity loss. The EC has adopted a new *EU Biodiversity Strategy* to help meet this goal. The strategy provides a framework for action over the next decade and covers the following key areas: 1. Conserving and restoring nature 2. Maintaining and enhancing ecosystems and their services 3. Ensuring the sustainability of agriculture, forestry and fisheries 4. Combating invasive alien species 5. Addressing the global biodiversity crisis	2, 3, 5, 6, 15, 16, 19, 21, 22, 23, 43, 47
Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services provides a comprehensive picture of how England is implementing the international and EU commitments. The mission for this strategy, for the next decade, is: To halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people. The Scottish biodiversity strategy comprises the *2020 Challenge for Scotland's Biodiversity* and *Scotland's Biodiversity: It's in your Hands* which set out how Scotland is implementing international and EU commitments. It is envisioned that by 2030 Scotland will be recognised as a world leader in biodiversity conservation. The *Northern Ireland Biodiversity Strategy* sets out a series of actions to protect and enhance biodiversity. It presents 76 recommendations aimed at halting the loss of biodiversity from Northern Ireland by 2016. The majority of recommendations are for the Government to achieve. One of the key challenges set out in the *Environment Strategy for Wales* is the identification of pressures on biodiversity and halting the decline in biodiversity. The individual country strategies for biodiversity and the environment in each of the four countries of the UK underpin the new *UK Post-2010 Biodiversity Framework*. The country strategies include further priorities and are supported by additional measures and indicators, reflecting the countries' different responsibilities, needs and views. Objectives of	67, 80, 84, 89, 112, 133, 134, 139, 153, 154, 162, 163, 168, 177

Objectives and Targets	Link to relevant plan, programme or strategy
the strategies are generally to: • Halt the loss of biodiversity and continue to reverse previous losses through targeted actions for species and habitats. • Increase awareness, understanding and enjoyment of biodiversity, and engage more people in conservation and enhancement. • Restore and enhance biodiversity in urban, rural and marine environments through better planning, design and practice. • Develop an effective management framework that ensures biodiversity is taken into account in wider decision making. • Ensure knowledge on biodiversity is available to all policy makers and practitioners.	
A number of designated sites are provided protection at an international level including: Ramsar Sites – wetlands of international importance. Special Protection Areas (SPAs) – a network of sites protected for rare and vulnerable birds as well as regularly occurring migratory species. Special Areas of Conservation (SACs) – high-quality conservation sites. In addition to these habitats, a number of species are also protected at the international level. In the UK protection is provided to a range of bird, other animal and plant species including Sites of Special Scientific Interest (SSSIs).	1, 3, 21, 22, 23, 51, 53, 54, 59, 70, 79, 88, 101, 115, 116, 117, 124, 125, 138, 143, 162
Landscape (Relevant to Environment and sustainability objective 4)	
Public authorities are encouraged to adopt policies and measures at appropriate levels to protect, manage and plan landscapes throughout Europe by *the European Landscape Convention*.	28
In England, Wales and Northern Ireland, nationally important landscapes are protected under the *National Parks and Access to the Countryside Act 1949*. This Act sets out to conserve and enhance certain areas for their natural beauty, with areas designated either as National Parks or Areas of Outstanding Natural Beauty (AONBs). In England, the *National Planning Policy Framework* states that the planning system should contribute to and enhance the natural environment by protecting and enhancing valued landscapes. In Scotland, National Parks are designated under *the National Parks (Scotland) Act 2000* with the aim of conserving and enhancing the natural and cultural heritage of the area. The character and appearance of National Scenic Areas are also safeguarded under the *Planning Etc. (Scotland) Act 2006*. In addition, *Scotland's Landscape Policy Framework* seeks to ''safeguard and enhance the distinct identity, the diverse character and the special qualities of Scotland's landscapes as a whole, so as to ensure tomorrow's landscapes contribute positively to people's environment and are at least as attractive and valued as they are today''.	49, 66, 85, 91, 153, 154

Objectives and Targets	Link to relevant plan, programme or strategy
Cultural Heritage (Relevant to Environment and sustainability objective 5)	
At the international level protection is provided for cultural and natural heritage of outstanding interest.	2, 30
In the UK, the historic environment should be protected and sustained and provision should be made for the investigation, preservation and recording of matters of archaeological or historic value. This is reflected in the policies of England, Scotland, Northern Ireland and Wales. In England, the *National Heritage Protection Plan* specifically sets out the approach for considering the historic environment in SEA and SA at each stage of the assessment process.	50, 52, 57, 63, 64, 77, 93, 146, 148, 149, 151, 153, 154, 169, 174, 177
The Water Environment (Relevant to Environment and sustainability objectives 6 and 7)	
There is a need to contribute to a high quality of life for citizens by providing an environment where the level of pollution does not give rise to harmful effects on human health and the environment. This is provided through measures to prevent or reduce pollutants and harmful emissions from entering water. The 'precautionary principle' should be applied when it comes to pollution of the water environment and Best Available Technology (BAT) and Best Environmental Practice principles should be followed. The 'polluter pays' principle is also important whereby the polluter is responsible for remediation of any damage they may cause to the environment.	24, 33, 48, 55, 87, 105, 106, 125, 133, 145, 154
The *Water Framework Directive (WFD) (2000/60/EC)* applies to all surface freshwater bodies (including lakes, streams and rivers), groundwaters and associated ecosystems, estuaries and coastal waters out to one mile from low-water. The WFD aims to: • Prevent further deterioration and protect and enhance the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems; • Promote sustainable water use based on a long-term protection of available water resources; • Enhance protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances; • Ensure the progressive reduction of pollution of groundwater and prevent its further pollution; and • Contribute to mitigating the effects of floods and droughts. Member States must monitor, protect, enhance and restore all surface and groundwater bodies and aim to achieve 'good' ecological and chemical water status by 22 December 2015. The WFD is translated into UK legislation and its approach to water management is consistently reflected in UK wide and regional strategies and plans.	27, 38, 87, 92, 105, 106, 154

Objectives and Targets	Link to relevant plan, programme or strategy
The *OSPAR Convention* aims to prevent pollution of the marine environment by discharges from land based activities and the *OSPAR Radioactive Substances Strategy* specifically sets the objective of preventing pollution of the maritime area from ionising radiation through the reduction of discharges, emissions and losses of radioactive substances. The ultimate aim is to reduce concentrations in the environment to near background values for naturally occurring radioactive substances and close to zero for other radioactive substances. Targets include that by 2020 OSPAR will ensure that discharges, emissions and losses of radioactive substances are reduced to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, emissions and losses are close to zero. The scope of this assessment is limited to non-radiological effects, as radiological effects and radiological safety are addressed in the Generic Safety Case.	8, 16, 17
Flooding (Relevant to Environment and sustainability objectives 7 and 13)	
All EU Member States are required to assess the risk of flooding from water courses and around coast lines, to map flood extent, assets and humans at risk from flooding in these areas, and to take measures to reduce flood risk.	39
In England and Wales, *The Flood & Water Management Act 2010* aims to provide better, more sustainable management of flood risk for people, homes and businesses, help safeguard community groups from unaffordable rises in surface water drainage charges and protect water supplies to the consumer. In Scotland, the *Flood Risk Management (Scotland) Act 2009* introduced a more sustainable approach to flood risk management in order to consider all sources of flooding including river, coastal and groundwaters. In Northern Ireland, the Government sets out its vision to reduce flood risk in order to facilitate the social, economic and environmental development in its document *Living with Rivers and the Sea*.	100, 106, 107, 110, 119, 128, 142
The latest climate projections indicate that sea levels will rise, and there will be increasingly severe and frequent rainstorms. This means the risk of floods will increase. Risks from flooding and coastal erosion should be managed by employing an integrated portfolio of approaches which reflect both national and local priorities so as: To reduce the threat to people and their property; and To deliver the greatest environmental, social and economic benefit consistent with the Government's sustainable development principles.	65, 83
Specific policy on how to take flood risk into account on development schemes can be found in the *NPPF* (England), *TAN15* (Wales), *Scottish Planning Policy and PPS15* (Northern Ireland).	71, 76, 153, 175, 177
Geology and Soils (Relevant to Environment and sustainability objective 6)	

Objectives and Targets	Link to relevant plan, programme or strategy
The *Environmental Liability Directive (99/31/EC)* focuses on the prevention and remediation of environmental damage, including land contamination, which presents a threat to human health. The Directive is based on the polluter pays principle. Polluters would therefore be responsible for remediating the damage they cause to the environment or of measures to prevent imminent threat of damage. The Directive provides specific criteria to determine when damage is significant, although damage from nuclear and maritime accidents falls outside the scope of the regime. Annex I of the Directive includes criteria for determining whether effects are significant and this could be used to inform the SEA process. Where possible, an integrated approach should be taken to prevent emissions to soil. Where this is not possible, emissions should be minimised in order to achieve a high level of protection for the environment as a whole. Specifically relating to landfill waste, the *Landfill Directive (99/31/EC)* is also intended to reduce and prevent the adverse effects of waste on the environment, including soil. The *EC's Thematic Strategy for Soil Protection* identifies eight main threats to soil: • Erosion • Organic matter decline • Contamination • Salinisation • Compaction • Soil biodiversity loss • Sealing • Landslides and flooding The Strategy advocates higher levels of protection to the soil resource than is currently in place.	26, 33, 37, 44
Little statutory protection exists specifically for soils in the UK, although they are indirectly protected by other legislation such as that covering the prevention of pollution and contamination, and for land use planning. In England, Defra aims for all England's soils to be managed sustainably and degradation threats tackled successfully by 2030. This will improve the quality of England's soils and safeguard their ability to provide essential services for future generations. The Environment Agency also seeks to protect water, air and soil from pollution by promoting good soil management.	55, 95, 114
Radioactive Substances and Nuclear Waste (Relevant to Environment and sustainability objective 8)	
UK radioactive substances regulation and policy is influenced by a number of international agreements and is underpinned by the *1957 Euratom Treaty* and subsequent EU Directives. EU Member States are responsible for putting in place national policies which: • Keep the generation of radioactive waste to the minimum practicable; • Ensure the interdependence of the different steps in spent fuel and radioactive waste generation and management; • Safely manage spent fuel and radioactive waste, including in the long term; • Implement appropriate measures following a graded approach; and	10, 20, 45

Objectives and Targets	Link to relevant plan, programme or strategy
• Govern all stages of the management of spent fuel and radioactive waste. Member States are required to dispose of their waste within their own territory unless they have concluded agreements with other Member States for the use of their disposal facilities.	
The UK Government's vision for nuclear energy is to have a nuclear sector that: • Has safety and security as its highest priorities, with the UK leading the world in safe and secure operations across the whole fuel cycle; • Continues to contribute to a low carbon and secure energy future, with nuclear energy being deployed efficiently and effectively, competing successfully with other low carbon technologies; • Leads the way in successfully decommissioning redundant nuclear facilities, including the environmentally safe disposal of nuclear waste; • Contributes to employment and prosperity in the UK including by exporting to overseas markets, respecting the imperative of not proliferating nuclear weapons; and • Continues to command public confidence, by operating safely, securely, sustainably and transparently.	170
The Government considers that the unnecessary introduction of radioactivity into the environment is undesirable, even at levels where the doses to both human and non-human species are low and, on the basis of current knowledge, are unlikely to cause harm. Activities involving ionising radiation are subject to the following controls: Justification of practices by the Government to ensure that the environmental, social and economic benefits they provide to society exceed the potential detriment resulting from them; Optimisation of protection on the basis that radiological doses and risks to workers and members of the public from a source of exposure should be kept as low as reasonably achievable, taking into account social and economic factors; and Application of limits and conditions to control discharges from justified activities to ensure that individuals (workers and members of the public) and sensitive environmental receptors are not exposed to unacceptable radiation risks from these practices.	102, 167
The *UK Strategy for Radioactive Discharges* is based on the following principles: Sustainable development, meeting the needs of the present without compromising the ability of future generations to meet their own needs and achieving the optimum balance in environmental, social and economic outcomes; and The use of Best Available Techniques (BAT) in England and Wales, and Best Practicable Means (BPM) and Best Practicable Environmental Option (BPEO) in Northern Ireland and Scotland, to prevent and, where that is not practicable, minimise waste generation and discharges to the environment.	102
The Government's policy for the long-term, safe and secure management of higher activity radioactive waste (which includes some low level waste that is not suitable for near surface disposal in current facilities) in the UK (excluding Scotland) is to place it deep underground	94, 152, 166, 171, 172, 179

Objectives and Targets	Link to relevant plan, programme or strategy
in a geological disposal facility (GDF), sited and developed in partnership with a willing UK community. The key needs in the disposal programme are therefore a willing host community with suitable geology. In Scotland, the policy for long-term management of higher activity radioactive waste is in near surface facilities. These facilities should be as near to the sites where the waste is produced as possible.	
Waste (Relevant to Environment and sustainability objective 8)	
The *EU Waste Framework Directive* requires all member states to take the necessary measures to ensure waste is recovered or disposed of without endangering human health or causing harm to the environment and includes permitting, registration and inspection requirements. The Directive also requires member states to take appropriate measures to encourage firstly the prevention or reduction of waste production and its harmfulness and secondly the recovery of waste by means of recycling, reuse or reclamation or any other process with a view to extracting secondary raw materials, or the use of waste as a source of energy. This system is known as the 'waste hierarchy'.	35, 40
Separate regulations exist transposing the *Waste Framework Directive (2008/98/EC)* into law in England and Wales, Scotland, and Northern Ireland and the principle of the waste hierarchy is reflected in each nation's policies. The Welsh Government's overarching waste strategy aims to reduce the impact of waste to within their environmental limits (which is defined as roughly 65% less waste than was being produced in 2010), aiming to phase out residual waste through enhanced actions on waste prevention and sustainable consumption and production and ensuring that all waste that is produced is reused or recycled by 2050.The Scottish Government aims for 70% of all waste to be recycled 2025. No specific targets are currently set for England and Northern Ireland. However, on 2 July 2014, the European Commission adopted a legislative proposal to review recycling and other waste-related targets in the EU Waste Framework Directive 2008/98/EC. The main elements of the proposal include: • Recycling and preparing for reuse of municipal waste to be increased to 70 % by 2030; • Improve resource efficiency by 30% by 2030; • 70% municipal waste recycling by 2030; • 80% packaging waste recycling target by 2030 with interim targets of 60% by 2020 and 70% by 2025; • Landfill bans for recyclable waste by 2025 and for all recoverable municipal waste by 2030; and • Plastics banned from landfill by 2025.	68, 127, 131, 155, 157, 158, 164, 165, 173, 180, 182, 183
The waste hierarchy is also at the heart of the regulation of radioactive waste. Operators are expected to reduce the quantity of waste and its impact on the environment by careful planning and design and reusing or recycling the materials they use. The energy and	102, 152, 178

Objectives and Targets	Link to relevant plan, programme or strategy
materials within waste that cannot be reused or recycled should be recovered, for instance by generating energy from the waste (such as incineration). Only where these options are not practicable should the waste be disposed of.	
Sustainable development (Relevant to Environment and sustainability objectives 9 and 11)	
The *2002 World Summit on Sustainable Development* reaffirmed the international community's commitment to sustainable development. The EU also has a long standing commitment to meet the challenges of sustainable development.	14
The *EU Sustainable Development Strategy* aimed to identify and develop actions to enable the EU to achieve a continuous long-term improvement of quality of life through the creation of sustainable communities that are: • Able to manage and use resources efficiently; • Able to tap the ecological and social innovation potential of the economy; and • In the end able to ensure prosperity, environmental protection and social cohesion. In recent years the EU has mainstreamed sustainable development into a broad range of its policies and has taken the lead in the fight against climate change and the promotion of a low-carbon economy.	36
In the UK sustainable development is about positive growth, making economic, environmental and social progress for current and future generations. Development should meet the needs of the present without compromising the ability of future generations to meet their own needs and an optimum balance between environmental, social and economic outcomes should be achieved. These sustainable development principles are reflected in UK legislation and policies across England, Wales, Scotland and Northern Ireland.	84, 89, 97, 113, 126, 130, 136, 144, 153, 156, 176, 177, 181
Noise (Relevant to Environment and sustainability objective 12)	
Harmful effects from noise, including annoyance, should be avoided, prevented and reduced. Each EU Member State is expected to determine exposure to environmental noise through noise mapping, ensure that information on environmental noise and its effects is made available to the public, and to adopt action plans based on noise mapping results with a view to preventing and reducing environmental noise where necessary (particularly where exposure effects could induce harmful effects on human health). Noise maps are available for England, Wales, Scotland and Northern Ireland.	32, 61, 150, 153
Planning Policy (Relevant to Environment and sustainability objective 11)	
The Planning Act 2008 provides primary legislation which establishes the legal framework for applying for, examining and determining applications for Nationally Significant Infrastructure Projects in England and Wales. There are 12 designated or proposed *National Policy Statements*, setting out Government policy on different types of national infrastructure development however none are specific to LLW.	56, 98, 132, 133, 140

Objectives and Targets	Link to relevant plan, programme or strategy
The *National Planning Policy Framework (NPPF)* sets out the Government's planning policies for England. At the heart of the *NPPF* is a presumption in favour of sustainable development. It identifies three dimensions to sustainable development: economic, social and environmental. In terms of its environmental role, the *NPPF* states that the planning system should contribute to protecting and enhancing the natural, built and historic environment, and as part of this, help to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change.	153
Planning Policy Wales (PPW) sets out the policy framework for Wales and is supplemented by 21 topic based *Technical Advice Notes (TANs)*. PPW seeks to contribute to sustainable development and seeks to reconcile the needs of development and conservation, securing economy, efficiency and amenity in the use of land, and protecting natural resources and the historic environment.	61, 86, 112, 126, 180, 181
In *Northern Ireland Planning Policy Statements* set out policies on particular aspects of land-use planning. The general principle set out in the policy statements is to make provision for necessary developments and at the same time protect the natural and built environment.	58, 64, 97, 104, 168
The *National Planning Framework* sets out the context for development planning in Scotland and provides a framework for the spatial development of Scotland as a whole. It sets out the Government's development priorities over the next 20-30 years and identifies national developments which support the development strategy. Specific policies for the development and use of land in Scotland are set out in *Scottish Planning Policy*.	62, 68, 75, 76, 77, 92, 101, 150, 151, 176, 177
Health and Safety (Relevant to Environment and sustainability objective 13)	
The *UK Strategy for Radioactive Discharges* states that there should be progressive reductions in human exposure to ionising radiation resulting from radioactive discharges. There are two groups of people who may be considered to be the most exposed to radiation from artificial sources; those who work with radioactivity (site workers) and members of the public who are likely to receive the highest radiation dose as a result of a given artificial radiation source (known as the critical group). The scope of this assessment is limited to non-radiological effects, as radiological effects and radiological safety are addressed in the Generic Safety Case.	9, 20, 111, 167
A number of health and safety objectives for the workplace have been identified for the UK. These include: • Identify new approaches to reduce further rates of accidents and ill health caused by work; • Ensure that the approach to health and safety regulation remains relevant for the changing world of work and address new and emerging work related health issues; • Use the work environment to help people maintain or improve their health; • Gain widespread commitment and recognition of what real health and safety is about; and Ensure those that fail their health and safety duties are held to account.	72, 109, 129

Objectives and Targets	Link to relevant plan, programme or strategy
Environmental Assessment (Relevant to Environment and sustainability objectives 1, 3, 4, 5, 6, 7, 8, 9, 10 and 11)	
The *SEA* Directive (2001/42/EC) requires that an environmental report is prepared in which the likely significant effects on the environment and the reasonable alternatives of a proposed plan or programme are identified. Environmental assessment of individual projects is carried out under the *EIA Directive (2011/92/EU)*. The principles underlying the Directives are: • to ensure that plans, programmes and projects likely to have significant effects on the environment are made subject to an environmental assessment, prior to their approval or authorisation; • to integrate environmental assessment into plans and programmes at the earliest stage to provide a high level of protection of the environment; and • to support sustainable development by ensuring that environmental assessment is carried out where there may be significant effects on the environment. Cross boundary environmental impacts of major projects should be considered through appropriate consultation.	4, 18, 23, 31, 46.
The Directives are given effect in UK law through separate Regulations covering a number of different consenting regimes.	73, 74, 78, 81, 82, 135, 147, 160

Appendix C Part 2: List of Plans, Programmes and Policies

The plans, programmes and policies numbered in the table above are listed below and ordered according to their international, European and national standing, and date of adoption or publication.

International

1. UNESCO (1971) Ramsar Convention on Wetlands of International Importance
2. UNESCO (1972) Convention Concerning the Protection of the World Cultural and Natural Heritage
3. UN (1979) Bonn Convention on the Conservation of Migratory Species of Wild Animals
4. UN (1991) Espoo Convention on Environmental Impact Assessment in a Transboundary Context
5. UN (1992) Conference on Environment and Development (Rio Earth Summit)
6. UN (1992) Convention on Biological Diversity
7. UN (1992) United Nations Framework Convention on Climate Change
8. OSPAR Commission (1992) Convention for the Protection for the Marine Environment of the North East Atlantic
9. IAEA (1994) Convention on Nuclear Safety
10. IAEA (1997) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
11. UN (1998) Kyoto Protocol to the United Framework Convention on Climate Change including DOHA amendment 2012
12. UNECE (1999) Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone
13. UN (2001) Stockholm Convention on Persistent Organic Pollutants (POPs)
14. United Nations (UN) (2002) World Summit on Sustainable Development, Johannesburg
15. OSPAR Commission (2003) Biodiversity and Ecosystems Strategy
16. OSPAR Commission (2003) Eutrophication Strategy
17. OSPAR Commission (2003) Radioactive Substances Strategy
18. UNECE (2003) Protocol on Strategic Environmental Assessment (Kiev Protocol)
19. Convention on Biological Diversity (2010)The Strategic Plan for Biodiversity 2011–2020 and The Aichi Targets

European

20. EU (1957) European Atomic Energy Community (EURATOM treaty) – Amended by Council Directive 96/29/EURATOM (Laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation)
21. EU (1979) Bern Convention on the Conservation of European Wildlife and Natural Habitats
22. EC (1979) Directive on the Conservation of Wild Birds (79/409/EEC)
23. EC (1992) The Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive) (92/43/EEC)

24. EC (1996) Directive on Integrated Pollution Prevention and Control (96/61/EC)
25. EC (1996) Air Quality Framework Directive (96/62/EC), and Daughter Directives (1999/30/EC), (2000/69/EC), (2002/69/EC), and (2004/107/EC)
26. EC (1999) Landfill Directive (99/31/EC)
27. EU (2000) Water Framework Directive (2000/60/EC)
28. EU (2000) European Landscape Convention
29. EC (2001) National Emission Ceiling Directive (2001/81/EC)
30. EU (2001) European Convention on the Protection of Archaeological Heritage (Revised)
31. EC (2001) The Strategic Environmental Assessment (SEA) Directive (2001/42/EC)
32. EU (2002) Environmental Noise Directive (2002/49/EC)
33. EU (2004) Environmental Liability Directive (2004/35/EC)
34. EU (2005) European Climate Change Programme (ECCP II)
35. EC (2005) Taking Sustainable Use of Resources Forwards: A Thematic Strategy on the Prevention and Recycling of Waste
36. EU (2006) European Strategy for Sustainable Development (Reviewed 2009)
37. EC (2006) Thematic Strategy for Soil Protection
38. EC (2006) Groundwater Daughter Directive (2006/118/EC)
39. EC (2007) Assessment and Management of Flood Risks Directive (2007/60/EC)
40. EU (2008) Waste Framework Directive (2008/98/EC)
41. EC (2009) Promotion of The Use of Energy from Renewable Sources Directive (2009/28/EC)
42. EC (2009) Fuel Quality Directive (2009/30/EC)
43. EC (2009) Birds Directive (2009/147/EC)
44. EU (2010) Industrial Emissions (Integrated Pollution Prevention and Control) (2010/75/EU)
45. EU (2011) Radioactive Waste and Spent Fuel Management Directive (2011/70/Euratom)
46. EU (2011) The Environmental Impact Assessment (EIA) Directive (2011/92/EU) (as amended by Directive 2014/52/EU)
47. EU (2011) Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (COM(2011) 244)
48. EU (2013) European Seventh Environmental Action Programme to 2020

National

49. National Parks and Access to the Countryside Act 1949
50. The Historic Buildings and Ancient Monuments Act 1953
51. Salmon and Freshwater Fisheries Act 1975
52. Ancient Monuments and Archaeological Areas Act 1979
53. The Wildlife and Countryside Act 1981
54. Wildlife (Northern Ireland) Order 1985

55. Environmental Protection Act 1990 (as amended)
56. Town and Country Planning Act 1990
57. Planning (Listed Buildings and Conservation Areas) Act 1990
58. Planning (Northern Ireland) Order 1991
59. The Conservation (Natural Habitats & C.) Regulations (Northern Ireland) 1995
60. Environment Act 1995
61. Welsh Assembly Government (1997) Technical Advice Note 11: Noise
62. The Town and Country Planning (Scotland) Act 1997
63. The Planning (Listed Buildings & Conservation Areas) (Scotland) Act 1997
64. DoENI (1999) Planning Policy Statement 6: Planning, Archaeology and The Built Heritage
65. Welsh Assembly Government (2000) Wales' Changing Climate, Challenging Choices – The Impacts of Climate Change in Wales From Now to 2080
66. National Parks (Scotland) Act 2000
67. DoENI (2002) Northern Ireland Biodiversity Strategy
68. Scottish Executive (2002) Planning Advice Note 63: Waste Management Planning
69. National Emission Ceilings Regulations 2002
70. The Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003
71. Welsh Assembly Government (2004) Technical Advice Note 15: Development and Flood Risk
72. HSE (2004) A Strategy for Workplace Health and Safety in Great Britain to 2010 and Beyond
73. The Environmental Assessment of Plans and Programmes Regulations 2004
74. The Environmental Assessment of Plans and Programmes Regulations (Northern Ireland) 2004
75. Scottish Executive (2004) Air Quality and Land Use Planning
76. Scottish Executive (2004) Planning Advice Note 69: Planning and Building Standards Advice on Flooding
77. Scottish Executive (2004) Planning Advice Note 71: Conservation Area Management
78. The Environmental Assessment of Plans and Programmes Regulations (Scotland) 2004
79. Nature Conservation (Scotland) Act 2004
80. Scottish Government (2004) Scotland's Biodiversity – It's In Your Hands
81. The Environmental Assessment of Plans and Programmes Regulations (Wales) 2004
82. The Environmental Assessment (Scotland) Act 2005
83. Defra (2005) Making Space for Water – Taking forward a new Government Strategy for flood and coastal erosion risk management in England
84. Defra (2005) Securing the Future – The UK Government Sustainable Development Strategy
85. Scottish Natural Heritage (2005) Landscape Policy Framework
86. Welsh Assembly Government (2005) Technical Advice Note 8: Renewable Energy

87. DoENI (2006) Integrated Coastal Zone Management Strategy for Northern Ireland 2006 - 2026
88. Natural Environment and Rural Communities (NERC) Act 2006
89. Welsh Assembly Government (2006) Environment Strategy for Wales
90. The Climate Change and Sustainable Energy Act 2006
91. Planning Etc. (Scotland) Act 2006
92. Scottish Executive (2006) Planning Advice Note 79: Water and Drainage
93. DCMS and Welsh Assembly Government (2007) Heritage Protection for the 21st Century
94. Welsh Assembly Government, Scottish Executive, Defra and DoENI (2007) Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom
95. Environment Agency (2007) Soil a precious resource: Strategy for protecting, managing and restoring soil
96. Climate Change Act 2008
97. DoENI (2008) Planning Policy Statement 21: Sustainable Development in the Countryside
98. Planning Act 2008
99. Welsh Assembly Government (2008) People, Places, Futures: The Wales Spatial Plan
100. DARDNI (2008) Living with Rivers and the Sea
101. Scottish Government (2008) Planning Advice Note 60: Planning for Natural Heritage
102. DECC (2009) UK Strategy for Radioactive Discharges (Revised)
103. Defra (2009) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Updated from 2007)
104. DoENI (2009) Planning Policy Statement 18: Renewable Energy
105. Environment Agency (2009) Water for people and the environment – Water resources strategy for England and Wales
106. Environment Agency (2009) Water for people and the environment – Water resources strategy for Wales
107. Flood Risk Management (Scotland) Act 2009
108. Climate Change (Scotland) Act 2009
109. HSE (2009) The Health and Safety of Great Britain: Be part of the solution
110. The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009
111. WAG, DoENI, The Scottish Government and DECC (2009) UK Strategy for Radioactive Discharges
112. Welsh Assembly Government (2009) Technical Advice Note 5: Nature Conservation and Planning
113. Welsh Government (2009) One Wales: One Planet – The Sustainable Development Scheme for Wales
114. Defra (2009) Safeguarding our Soils – A Strategy for England
115. The Eels (England and Wales) Regulations 2009 (as amended)
116. Marine and Coastal Access Act 2009

117. Marine (Scotland) Act 2010
118. DoETINI (2010) A Strategic Energy Framework for Northern Ireland
119. Flood & Water Management Act 2010
120. The Air Quality Standards (Wales) Regulations 2010
121. The Air Quality Standards (Northern Ireland) Regulations 2010
122. The Air Quality Standards Regulations 2010
123. The Air Quality Standards (Scotland) Regulations 2010
124. The Conservation of Habitat and Species Regulations 2010
125. The Environment (Northern Ireland) Order 2002
126. Welsh Assembly Government (2010) Technical Advice Note 6: Planning for Sustainable Rural Communities
127. Welsh Government (2010) Towards Zero Waste: The overarching waste strategy document for Wales
128. Environment Agency (2010) National Flood and Coastal Erosion Risk Management Strategy for England
129. HM Government (2010) Healthy Lives, Healthy People: Our strategy for public health in England
130. Northern Ireland Executive (2010) Everyone's Involved: Sustainable Development Strategy
131. Scottish Government (2010) Zero Waste Plan
132. DECC (2011) National Policy Statement for Nuclear Power Generation (EN-6) (Volume 1 and Volume 2)
133. DECC (2011) Overarching National Policy Statement for Energy (EN1)
134. Defra (2011) Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services
135. The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011
136. Scottish Government (2011) Achieving Sustainable Future: Regeneration Strategy
137. Scottish Government (2011) 2020 Routemap for Renewable Energy in Scotland
138. Wildlife and Natural Environment (Scotland) Act 2011
139. HM Government (2011)Natural Environment White Paper – The Natural Choice: Securing The Value of Nature
140. Localism Act 2011
141. Welsh Government (2011) Climate Change Strategy for Wales
142. Welsh Government (2011) National Strategy for Flood and Coastal Erosion Risk Management in Wales
143. Wildlife and Natural Environment Act (Northern Ireland) 2011
144. Defra (2011) The Government Carbon Plan
145. Defra (2011) Water for Life – Water White Paper
146. English Heritage (2011) The Setting of Heritage Assets
147. Town and Country Planning (Environmental Impact Assessment Regulations) 2011

148. Historic Scotland (2011) Scottish Historic Environment Policy
149. Historic Environment (Amendment) (Scotland) Act 2011
150. Scottish Government (2011) Planning Advice Note 1/2011: Planning and Noise
151. Scottish Government (2011) Planning Advice Note 2/2011: Planning and Archaeology
152. Scottish Government (2011) Scotland's Higher Activity Radioactivity Waste Policy
153. Department for Communities and Local Government (2012) National Planning Policy Framework (NPPF)
154. NIEA (2012) Our Passion, Our Place
155. Northern Ireland Executive (2012) Programme for Government 2011-2015
156. The Sustainable Communities Regulations 2012
157. The Waste (England and Wales) (Amendment) Regulations 2012
158. Waste (Scotland) Regulations 2012
159. Welsh Government (2012) Energy Wales: A Low Carbon Transition
160. The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2012
161. Scottish Government (2013) Route Map for Renewable Energy in Scotland
162. The Marine Act (Northern Ireland) 2013
163. Scottish Government (2013) 2020 Challenge for Scotland's Biodiversity – A Strategy for the Conservation and Enhancement of Biodiversity in Scotland
164. Defra (2013) Waste Management Plan for England
165. DoENI (2013) Delivering Resource Efficiency: Northern Ireland Waste Management Strategy
166. CoRWM (2013) Statement on Geological Disposal
167. Defra, DECC, NDA and EA (2013) Managing the use and disposal of radioactive and nuclear substances and waste
168. DoENI (2013) Planning Policy Statement 2: Natural Heritage 2013
169. English Heritage (2013) The National Heritage Protection Plan (Revision 2)
170. HM Government (2013) Long Term Nuclear Energy Strategy
171. HM Government (2013) Nuclear Industrial Vision Statement
172. HM Government (2013) Nuclear Industry Strategy: The UK's nuclear future
173. The Waste (Amendment) Regulations (Northern Ireland) 2013
174. Welsh Government and Cadw (2013) Historic Environment Strategy for Wales
175. DoENI (2014) Planning Policy Statement 15: Planning and Flood Risk
176. Scottish Government (2014) Scotland's Third National Planning Framework (NPF3)
177. Scottish Government (2014) Scottish Planning Policy
178. Scottish Government et al (2014) Strategy for the Management of Naturally Occurring Radioactive Material (NORM) waste in the United Kingdom
179. DECC (2014) Implementing Geological Disposal
180. Welsh Government (2014) Technical Advice Note 21: Waste

181. Welsh Government (2014) Planning Policy Wales (Edition 7)

182. EC (2014) Proposals for a Directive of the European Parliament and of the Council amending Directives 2008/98/EC on waste, 94/62/EC on packaging and packaging waste, 1999/31/EC on the landfill of waste, 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment

183. DCLG (2014) National Planning Policy for Waste

Appendix D – Baseline Evidence

This section provides a generic overview of baseline information that has informed and been taken into consideration during the assessment of the Strategy.

Facilities and Sites

There are 45 sites which have been considered in gathering this baseline information, listed in Table D.1. The nuclear industry includes facilities used for power generation, research, defence and industrial medical purposes. These facilities are in various stages of operation, with the NDA overseeing the decommissioning and closure of 15 sites. Since the focus of the Strategy is low level radioactive waste (LLW), available and operational facilities for the management of LLW have also been considered. These include commercial incinerators, landfills and metals recycling facilities.

Table D.1 Details of sites considered in baseline information

Site	Owner/Operator	Waste Man. Facilities	2014 Status	Status change since 2009? If ✓ previous status
Power Generation				
Berkeley	Magnox	None	Prep for care and maintenance	×
Bradwell	Magnox	None	Prep for care and maintenance	×
Capenhurst	Capenhurst Nuclear Services and Urenco	None	Joined to adjacent operational site. Decommissioning of some facilities.	✓ Quiescent storage
Chapelcross	Magnox	None	Prep for care and maintenance	✓ Defuelling
Dungeness A	Magnox	None	Prep for care and maintenance	✓ Defuelling
Dungeness B	EdF Energy	None	Operational	×
Hartlepool	EdF	Incinerator	Operational	×
Heysham 1	EdF	None	Operational	×
Heysham 2	EdF	None	Operational	×
Hinkley Point A	Magnox	None	Prep for care and maintenance	×

Site	Owner/Operator	Waste Man. Facilities	2014 Status	Status change since 2009? If ✓ previous status
Hinkley Point B	EdF	None	Operational	×
Hinkley Point C	NNB Generation	None	Planned (planning permission granted)	✓ Early planning stages
Hunterston A	Magnox	None	Undertaking care and maintenance preparations. Care and maintenance to begin 2022.	×
Hunterston 'B'	EdF	None	Operational	×
Oldbury	Magnox	None	De-fuelling	✓ Operational
Sellafield (including Calder Hall and Windscale)	Sellafield Ltd	Landfill Metal de-contamination High-force compactor Onsite disposal	ILW Store and fuel reprocessing operational Prep for hazard reduction and decommissioning	×
Sizewell A	Magnox	None	De-fuelling complete	✓ Defuelling
Sizewell B	EdF	None	Operational	×
Springfields	Westinghouse	None	Operational and partial decommissioning.	✓ Operational
Torness	EdF	None	Operational	×
Trawsfynydd	Magnox	None	Undertaking care and maintenance preparations. Care and maintenance to begin 2016.	×
Wylfa	Magnox	None	Operational. Defueling scheduled to begin in 2015.	× (but delayed programme)
Research				
Culham JET	CECC	None	Planned decommissioning	× (but delayed programme)
Dounreay	DSRL	Disposal, High force compactor	Decommissioning - undertaking care and maintenance and associated preparations. ILW storage under construction.	×
Harwell	Magnox Ltd.	None	Decommissioning	×
Silwood Park	Imperial College STM	None	Planned decommissioning	✓ Operational
Winfrith	Magnox Ltd.	Metal de-contamination	De-licensed. In care and maintenance	✓ Preparation for care and maintenance.

Site	Owner/Operator	Waste Man. Facilities	2014 Status	Status change since 2009? If ✓ previous status
			phase	
Defence				
Aldermaston	AWE/MOD	None	Operational	×
Barrow	BAE	None	Operational	×
Burghfield	AWE/MOD	None	Operational	×
Clyde Naval Base	MOD	None	Operational	×
Rolls Royce Derby	Rolls Royce Marine Power Operations Ltd	None	Operational	×
Devonport	Devonport Royal Dockyard Ltd	None	Operational	×
Rosyth Royal Dockyard	Rosyth Royal Dockyard Limited	None	Operational	×
Medical Industry				
Amersham	GE Healthcare	None	Operational	×
Cardiff	GE Healthcare	None	Operational	×
Waste Management				
Clifton Marsh	SITA	Landfill	Operational	✓ No LLW permitted
Colnbrook	Grundons	Incinerator	Operational	✓ Clinical LLW waste
Ellesmere Port	Veolia	Incinerator	Operational	✓ No LLW permitted
Fawley	Tradebe	Incinerator	Operational	×
Inutec (at Winfrith)	Tradebe	High force compactor	Operational	✓ New facility
ENRMF, near Kings Cliffe	Augean	Landfill	Operational	✓ No LLW permitted
Lillyhall	FCC Environment	Landfill	Operational	✓ No LLW permitted
Lillyhall	Studsvik UK	Metal Recycling	Operational	×
LLWR	LLW Repository Ltd	Disposal	Operational	×
Sandwich	Augean	Incinerator with energy recovery	Operational	✓ Newly licenced for LLW

Information has been collated for the above sites in line with the SEA's objectives. The subsequent sections of this appendix provide an overview of information by topic.

Air Quality

This objective considers information relating to the emissions of pollutants and particulate matter, as well as radioactive discharges to the atmosphere. It does not cover the emission of greenhouse gases as this covered under Global Climate Change and Energy.

The air quality baseline is relevant in relation to the following environmental and sustainability objectives:

- Global Climate Change and Energy
- Biodiversity, Flora and Fauna
- Geology, Ground and Groundwater Quality
- Surface Water Resources and Quality
- Waste
- Traffic and Transport
- Land Use

Radioactive Emissions

The public dose limit for radiological discharges to the atmosphere is 1mSv per year. This limit is set conservatively so that even discharges at these limits would not pose a significant risk to human health or areas of biodiversity. The doses associated with current aerial discharges from the nuclear industry and waste management facilities are a small fraction of the public dose limit and well within the relevant dose constraints. Furthermore, only a small proportion of these discharges from nuclear sites derive from LLW and associated activities.

The current sources of radioactive emissions from the decay of LLW in the nuclear industry are outlined in the table below.

Table D.2 Radioactive emissions baseline

Source of Emissions	Emissions	Data source(s)
On site		
Gaseous decay of LLW in interim storage or ventilation air from contaminated facilities undergoing decommissioning.	Information relating to radioactive discharges is not broken down by source for the nuclear industry sites. However, the doses associated with all aerial discharge are within relevant dose constraints.	Site specific environmental reports.
Operations as part of the decommissioning process such as retrieval of waste onsite.	Aerial discharges of radioactive material are minor but regular.	Site specific environmental reports.
LLWR Storage		
Discharges of decay products to air due to ventilation of storage areas in LLWR.	The main discharges are radio chemicals, radon (50µSv) and compounds of C14 (<0.6 µSv) and H3 (e.g. tritium - 4 µSv). There are also radioactive particulates (17µSv).	LLWR Ltd (2011) The Environmental Safety Case
	The gaseous alpha and beta discharges in 2012 were $2.87e^{+04}$ and $1.41e^{+05}$ respectively.	Cefas (2013) Radioactivity In Food and the Environment, 2012.

Transportation		
Discharge to air of decay products during transportation of LLW	Regulated by Office for Nuclear Regulation (ONR) to ensure that nuclear packages are within UK Transport Legislation. Previous maximum dose uptake by the public for road and rail transport of ILW/LLW estimates of <4µSv per year. LLW does not usually require special shielding during transport.	ONR (2013) A guide to nuclear regulation in the UK WNTI (2006) Radiation Dose Assessment for the Transport of Nuclear Fuel Cycle Materials NDA (2010) UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry
Treatment		
Off gases from the incineration of LLW. Commercial facilities are utilised at Colnbrook, Ellesmere Port, and Fawley.	The main discharges are volatile radio chemicals – compounds of H3, C14, S35 and various Iodine isotopes, plus small amounts of particulate matter which could contain any beta-emitter.	DECC (2009) UK Strategy for Radioactive Discharges. Discharges provided in Cefas (2013) Radioactivity In Food and the Environment, 2012.
Discharges to air from metal recycling/decontamination processes. (Lillyhall, Sellafield, Winfrith, Studsvik)	Radioactive particulate matter discharged.	Cefas (2013) Radioactivity In Food and the Environment, 2012
Disposal		
Emissions from waste disposed in authorised landfill sites.	Aerial discharges are not measured.	DECC (2009) UK Strategy for Radioactive Discharges

Non-radioactive Emissions

There is no evidence of odour nuisance being caused by LLW management or disposal activity currently undertaken on nuclear industry sites. Commercial treatment/disposal landfill sites are associated with methane and hydrogen sulphide emissions; these emissions are monitored at some sites, at which there is currently no evidence of odour nuisance.

In the UK, 276 Local Authorities have declared Air Quality Management Areas (AQMAs) where air quality management objectives have been exceeded. There are no nuclear industry sites within AQMAs. This is generally due to their rural location as AQMAs are predominantly in urban areas and related to NO_2 and PM_{10} emissions associated with road networks. Two sites are within 2km of AQMAs; these are Rolls Royce Marine Power Operations Ltd in Derby and the AWE site at Burghfield. Treatment and disposal sites can be found near urban areas; Clifton Marsh (landfill) is within 2km of an AQMA, Ellesmere Port (Incinerator), and Colnbrook (Incinerator) are all within 5km of AQMAs.

The baseline relating to emissions of Nitrogen Dioxide (NO_2) and particulates due to industrial processes associated with LLW are outlined in the table below.

Table D.3 Non-radioactive emissions baseline

Source of Emissions	Emissions	Data source(s)
On site activity		
Emissions from equipment onsite associated with short duration construction and demolition activities.	Small quantities of oxides of nitrogen (NOx), oxides of sulphur (SO_x) and particulate matter (PM_{10}) and other combustion by-products are generated. These are intermittent. Low level emissions of dust are	Site specific environmental reports.

	generated, usually confined to the site boundary.	
Transportation		
Emissions from vehicles moving on and between sites.	Small quantities of NO_2, PM_{10} and other combustion by-products are generated. HGVs are mainly used to transport ISO containers between sites. Dust may be generated through transportation.	Site specific environmental reports.
Treatment		
Off gases from the incineration of LLW. There are currently no onsite facilities in operation. Commercial incinerator facilities at Colnbrook, Fawley and Ellesmere Port are licenced to incinerate LLW.	Non-radioactive discharges from commercial incinerators are regulated under the IPPC by Pollution Prevention and Control licences.	Site permits
Discharges from grouting facilities required to package LLW. There are grouting facilities at LLWR and Dounreay.	Dust is generated. As it is a contained process which is authorised by the local authority, discharges in normal operating conditions are minimal.	Site specific reports

Global Climate Change and Energy

This objective considers information relating to direct and indirect emissions of greenhouse gases. It also contains information relating to the implications of climate change on nuclear industry sites.

The global climate change and energy baseline is relevant in relation to the following environmental and sustainability objectives:

- Air Quality
- Traffic and Transport
- Landscape and Visual
- Biodiversity, Flora and Fauna
- Surface Water Resources and Quality

Greenhouse Gas Emissions

In 1990 greenhouse gas emissions in the UK were 779.9 million tonnes carbon dioxide equivalent ($MtCO_2e$). There has been a declining trend in the intervening years, reaching a low of 566.2 $MtCO_2e$ in 2011. There was a rise in 2012 to 583.1 $MtCO_2e$, but emissions fell back to 568.3 $MtCO_2e$ in 2013. This reflects a small fall from the confirmed figures for 2012 of 583.1 Mt. It should be noted that these figures do not include for 'embedded' carbon, and therefore do not allow for the UK's full carbon footprint (Department of Energy and Climate Change, March 2015, *2013 UK Greenhouse Gas Emissions, Final Figures - Statistical Release*), https://www.gov.uk/government/statistics/final-uk-emissions-estimates, accessed November 2015.

Note that the consultation draft of this Appendix (published January 2015) used the UK Greenhouse Gas Emissions Provisional Figures. The Final Figures used here were published in March 2015. While there are small variations between the two sets of figures, the trends are the same and there are no changes in any relevant conclusions arising from them.

Although the nuclear industry produces low-carbon energy, emissions of greenhouse gases occur primarily due to indirect emissions from energy supplied by the National Grid.

The baseline relating to greenhouse gas emissions associated with LLW is outlined in the below table.

Table D.4 Greenhouse gas emissions baseline

Source of Emissions	Emissions	Data source(s)
Incineration		
The incineration of LLW generates CO_2 emissions. Commercial facilities are utilised at Ellesmere Port, Colnbrook and Fawley.	Emissions vary by site. The incinerator at Fawley emitted over 40,000 tonnes of CO_2 in 2012. The Colnbrook incinerator emitted less than 10,000 tonnes.	Environment Agency (WIYBY)
Transportation		
Emissions from vehicles moving on and between sites and delivering supplies. HGVs are mainly used to transport ISO containers of waste between sites. Some waste is transported by rail.	The average emissions of CO_2 per km for articulated HGVs in are 0.99kgCO_2e. Emissions from rail are much lower.	DEFRA and DECC (2014) UK Government Conversion Factors for company reporting. DfT (2009) Low Carbon Transport: A greener future.
Onsite use of electric vehicles.	The use of electric vehicles by teams onsite at Hinkley Point reduces direct emissions of greenhouse gases. However the energy required to charge the vehicles results in (smaller) indirect emissions.	Magnox (2014) Hinkley Point A SEA site specific baseline.
Energy (indirect emissions)		
Energy is required for the domestic operations of the facilities. The majority of this energy is derived from the national grid which has heavy reliance on the combustion of fossil fuels. Some sites are involved in energy reduction schemes.	As little as 1% of the energy used at nuclear industry sites is used for minor plant, lighting and heating. For 2012 this would equate to about 6000teCO_2e.	EA (2012) Nuclear Sector Plan 2012 Environmental Performance Report
The grouting process used to package LLW is energy intensive.	It is the most energy intensive stage of the nuclear fuel life cycle, with estimated energy use and associated carbon emissions of 42.8MWh/canister and 12.8teCO2e/canister. However, the packing efficiency has an impact on the volume of grouting used.	Willey (2012) Life Cycle Analysis of the Nuclear Fuel Cycle.

Climate Change

The location of some nuclear industry sites and LLW management sites within coastal or flooding zones potentially makes them vulnerable to climatic factors and therefore these have established controls to protect them. The UK Climate Projections 2009 highlight that the UK will become warmer, particularly during summer while extreme weather events such as severe storms, winds, exceptional rainfall and consequent flooding may become more frequent. These changes may result in an increase in vulnerability of sites susceptible to climatic factors as highlighted in the table below.

Table D.5 Vulnerability to climatic factors baseline

Type of Risk	Sites at Risk	Data source(s)
Flooding		
Rainfall is anticipated to increase and for storms to become more intense. Sea levels are expected to rise. There might be increased risk of surface water, fluvial and/or tidal flooding.	AWE Aldermaston Berkley Bradwell AWE Burghfield GE Cardiff Chapelcross (fluvial only) Clifton Marsh Clyde Naval Base Rolls Royce Derby Dounreay Dungeness A and B Ellesmere Port Fawley Hartlepool Hinkley Point A, B and C Hunterston A LLWR Oldbury Sellafield (including CLESA) Torness	The UK Climate Projections 2009 (UKCP09) Site specific reports EA Flood risk maps
Coastal Erosion		
An increase in extreme weather is anticipated to accelerate coastal erosion.	Dounreay Dungeness Ellesmere Port Fawley Hartlepool Hunsterston A and B LLWR (in 1000+ years) Sellafield including CLESA Sizewell A and B	The UK Climate Projections 2009 (UKCP09) Site specific reports EA flood risk maps
Wind		
Revised wind loading guidance together with climate change uncertainties have led to the commissioning of major strengthening work.	Trawsfynydd	Site specific report
No significant risk identified		

	GE Amersham Capenhurst Colnbrook Culham JET Devonport Dockyard ENRMF, near Kings Cliffe Harwell Heysham Lillyhall Studsvik Rosyth Dockyard Silwood Park Springfield Winfrith Wylfa	Site specific reports EA flood risk maps

Biodiversity, Flora and Fauna

This objective considers information relating to the range of wildlife (fauna) and vegetation (flora) and their supporting habitats that contribute to the ecological biodiversity of an area. Of particular note are valued ecological receptors such as designated sites and protected species.

The biodiversity, flora and fauna baseline is relevant in relation to the following other objectives:

- Air Quality
- Traffic and Transport
- Landscape and Visual
- Noise and Vibration
- Global Climate Change and Energy
- Geology
- Geology, Ground and Groundwater Quality
- Surface Water Resources and Quality

Designated Sites

Ramsar sites are designated under the Ramsar Convention on Wetlands of International Importance. Additional nature conservation sites of importance at a European level are designated under European Union legislation (the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC)), and the national legislation that gives them effect in the UK). In the UK, these Directives have given rise to Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

Nationally important nature conservation sites are protected as Sites of Special Scientific Interest (SSSIs) (Areas of Special Scientific Interest in Northern Ireland).The majority of nuclear industry sites and waste management sites are located within close proximity (2 km) of international or nationally designated sites of ecological importance (Defra, 2015).

See Table D6 on the next page.

Table D.6 Designated sites baseline

Site	Designated Sites within 2km					
	SSSI	SPA	SAC	Ramsar	NNR	LNR
AWE Aldermaston	4					2
BAE Barrow	2	2	1	2	1	
Berkeley	1	1		1		
Bradwell	2	2	1	2	1	
Cardiff GE healthcare	5		1			
Clifton Marsh	2	1	0	1	1	0
Colnbrook	0	1	0	1	0	1
Rolls Royce Derby						3
Devonport Royal Dockyard	4	1	1			
Dounreay	2	1				
Dungeness A and B	2	1	1		1	
ENRMF	3	0	0	0	2	0
Ellesmere Port	1	1	0	1	0	1
Fawley	2	2	2	2	0	0
Hartlepool	4	1		1	1	1
Heysham 1 and 2	3	1	1	1		
Hinkley Point A, B and C	2	1	1	1	1	
Hunsterston A and B	1					
LLW Repository, West Cumbria	3		1		1	
Oldbury	1	1		1		
Rosyth Royal Dockyard	3	1		1		
Silwood Park, Ascot	1		1			
Sizewell A	3	2	1	1		
Sizewell B	3	2		1		
Springfields	1					
Torness	1					
Trawsfynydd	3	1	2		1	
Winfrith		1	1	1		
Wylfa		1	1			

There have been no designated sites identified within 2 km of the following sites:

- Amersham GE healthcare
- Burghfield
- Capenhurst
- Chapelcross
- Clyde Naval Base
- Culham JET
- Harwell
- Lillyhall MRF
- Lillyhall Landfill
- Sellafield (including CLESA, Calder Hall and Windscale)

Habitats and Species

European Protected Species (EPS) in the UK are those covered by Schedule 2 of the Conservation of Habitats and Species Regulations 2010. A list of the animal species that this includes can be found at http://www.legislation.gov.uk/ukpga/1981/69/contents. A range of other animal species and plants are given protection to varying degrees, or under certain circumstances or times of year, under UK legislation.

Most nuclear sites have biodiversity action plans (BAPs) to manage or enhance the flora and fauna present on site or on surrounding land. As well as working on their own sites, many operators work in the local area to encourage biodiversity. The Winfrith site has Sites of Special Scientific Interest (SSSIs) within its boundary. These areas are managed by Magnox Limited as part of its Heathland Management Plan, (which supplements its BAP) in consultation with Natural England.

Twenty-five nuclear industry sites and five LLW management sites are situated in close proximity to coastal and marine environments, including estuaries. Some of these habitats are protected under the designations mentioned above. Sea water monitoring and monitoring of fished marine life is in place around these sites.

Landscape and Visual

This objective considers information relating to the hierarchy of the different components that interact to form a landscape and the elements, characteristics and patterns that interact to form distinct landscape character areas. It also considers the visual amenity of the area.

The landscape and visual baseline is relevant in relation to the following environmental and sustainability objectives:

- Air Quality
- Global Climate Change and Energy
- Landscape and Visual
- Surface Water Resources and Quality
- Traffic and Transport
- Waste

Many of the UK's nuclear sites are located in rural locations. The general scale of the buildings associated with a number of the sites makes them relatively noticeable features which have a significant effect on the landscape..

Table D.7 Visual features baseline

Visual Features		Date source(s)
Incineration		
Incineration facilities include a stack and associated plumes that are visible.	The facilities contribute to the landscapes' signatures. However off-site incinerators are located in areas already characterised by industry.	
Storage and Disposal		
Structures on site required for storage.	The facilities for storage and disposal contribute to the landscapes' signatures. However, compared to facilities relating to other on site activities, their impact is limited.	Site specific reports. 2009 SEA baseline.
Off-site disposal facilities (landfill)	The facilities for disposal contribute to the landscapes' signatures. However, the sites permitted for LLW were already operational for other waste before LLW was accepted.	Site permits
Transportation		
The transportation of waste and/or supply materials via HGVs or rail.	Industrial presence in rural areas reduces the landscape character quality.	

Surrounding Landscapes

The visual impact that the sites have also depends on the sensitivity of the landscape, which may be influenced by its topography. Landscapes of national importance in the UK are protected as National Parks, Areas of Outstanding Natural Beauty (AONBs), and Heritage Coasts.

A number of the sites are within or near to AONBs from which they are visible. These sites are:

- Culham Jet (North Wessex Downs)
- Devonport (Cornwall)
- Dungeness A and B (Kent Downs and High Weald)
- Harwell (North Wessex Downs)
- Hinkley Point A, B and C (Quantock Hills)
- Sizewell A and B (Suffolk Coasts and Heaths).

Trawsfynydd is located within the Snowdonia National Park and is visible throughout the valley of Lake Trawsfynydd. Sellafield, the LLWR and both the Lillyhall MRF and landfill are located west of the Lake District National Park, an area with high fells from which the nuclear sites are visible. In addition, the nuclear sites at Sizewell and Wylfa are located on Heritage Coasts. The site at Winfrith is in close proximity to coastline which has been designated as a Heritage Coast.

Each site is within a particular Natural Character Area, which is defined by a unique combination of landscape, biodiversity, geodiversity, and cultural and economic activity. The boundaries of the NCAs follow the natural lines in the landscape rather than administrative areas. Maps and profiles for each NCA are available from the relevant authorities, as follows:

- www.naturalengland.org.uk/publications/nca/
- The Landscape Character Map for Wales (Countryside Council for Wales)

Cultural Heritage

Cultural heritage refers to the historic elements of an area that contribute to a sense of place and cultural identity. It is represented by a variety of features, both above and below ground, which result from past human use of the landscape. These include standing buildings, many still in use, subsurface archaeological remains and artefact scatters. It also includes earthwork monuments as well as landscape features such as field boundaries and industrial elements, from prehistoric to modern times.

The cultural heritage baseline is relevant in relation to the following environmental and sustainability objectives:

- Air Quality
- Traffic and Transport
- Landscape and Visual
- Biodiversity, Flora and Fauna
- Surface Water Resources and Quality
- Noise and Vibration
- Global Climate Change and Energy
- Geology, Ground and Groundwater Quality

Scheduled Monuments and Listed Buildings

The UK has a rich historic environment reflecting thousands of years of human occupation, settlements and activities. The most important features are designated for protection such as Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and the Register of Historic Battlefields. Features which have been designated for protection are potential receptors for the effects of the Strategy. There are a number of such features within 2km of a nuclear site as identified from using Defra's Magic GIS application (www.magic.gov.uk) and listed below. There are no Registered Battlefields within 2km of any nuclear industry sites.

See table D8 on the following page.

Sub-surface Features

Due to the historic activity on developed areas on many of the nuclear industry sites (including former munitions factories and RAF bases) any undiscovered archaeological remains are likely to be in a poor state of preservation and are not considered likely to be of significant importance.

Nuclear Facilities

The age and pioneering status of some of the nuclear facilities may themselves be considered of particular historic interest. However, neither the Fast Reactor Sphere at Dounreay (the world's first fast breeder reactor) nor Calder Hall Reactor 1 (the world's first commercial nuclear power station) will be preserved as part of the cultural heritage strategies for the sites as it was not considered value for money to do so in either case.

Table D.8 Designated cultural heritage baseline

Site	Scheduled Monuments	Listed Buildings	Registered Parks and Gardens
Aldermaston	8	70	1
Barrow		92	
Berkeley	1	15	1
Bradwell	2	37	
Burghfield		17	
Capenhurst		12	
Clifton Marsh Landfill		6	
Colnbrook Incinerator		63	
Culham JET	4	48	1
Derby	1	26	
Devonport	13	341	
Dungeness A	4		
Dungeness 'B'	4		
ENRMF		4	
Ellesmere Port Incinerator	1	19	
Fawley Incinerator	5	2	
Harwell	1	26	
Heysham 1	2	29	
Heysham 2	2	29	

Lillyhall (Landfill)		4
Lillyhall (MRF)		4
LLWR	1	7
Oldbury	1	15
Sellafield (including CLESA, Calder Hall and Windscale)	2	15
Silwood Park, Ascot		46
Sizewell A		3
Sizewell B		3
Springfields		24
Winfrith	14	60

Geology, Ground and Groundwater Quality

This objective considers information relating to the contamination of the ground and groundwater by both radiological and non-radiological means. The geology and soils are also considered.

The geology, ground and groundwater quality baseline is relevant in relation to the following environmental and sustainability objectives:

- Air Quality
- Global Climate Change and Energy
- Landscape and Visual
- Surface Water Resources and Quality
- Traffic and Transport
- Waste

Radioactive Contamination

Some sites have no contaminated land, while others have legacy contamination issues varying from a few tens of cubic metres of contamination to millions of cubic metres to manage. All sites are committed to avoiding any future land contamination. Where appropriate, sites have developed Land Quality Management Plans, which may involve monitoring programmes, mitigation and clean-up activities. The Environment Agency, Scottish Environment Protection Agency (SEPA) and the Office for Nuclear Regulation (ONR) are working with the industry to develop these plans. Some of this contaminated land may require treatment and disposal dependent on the desired end state of the site. Information relating to radioactive contamination is outlined in the table below.

Table D.9 Radioactive contamination baseline

Source of Contamination	Contamination	Data source(s)
Effluent Drains		
Leaks and leachate from drains causing radioactive contamination.	Common contaminants are compounds of H3, Caesium-137 and Strontium-90. Of these, H3 is the most mobile as its behaviour is indistinguishable from groundwater.	SEA Baseline 2009.
Waste Storage and Disposal		
Historic in-site disposal of waste has resulted in contaminated soil.	Installation of the interim trench cap at LLWR has resulted in decreased concentrations of radionuclides in groundwater. These concentrations are very low and there is little evidence to support propositions that radioactivity from this leachate is transferring to foodstuffs.	LLWR Environmental Safety Case 2011. Cefas (2013) RIFE 2012
LLW off-site disposal	Disposal of LLW to landfill may result in contamination. Gamma spec, total alpha and beta, and tritium monitoring is performed for groundwater, surface soils and leachate at these sites as required by the relevant permit.	Site permits Cefas (2013) RIFE 2012

	Monitoring at the ENRMF site has shown no significant levels of Tritium H3 in down-gradient borehole samples since the site began accepting LLW.	
Historic release of irradiated nuclear fuel particles in the 1960s and 70s at Dounreay.	By the end of 2012 2,200 particles were recovered from the sea bed. A new low level liquid waste treatment system has been installed rendering a continuing release of particles from site today highly unlikely.	Dounreay website.
Reprocessing Activities		
Historic leaks and spills on-site have contaminated land and contaminants have subsequently migrated to groundwater.	The most significant historic liability lies at Sellafield with approximately 13 million cubic metres of ground being contaminated. The predominant beta-emitting radionuclide in groundwater at Sellafield is Strontium 90. Other sites where management of contaminants is likely to require a management plan include Dounreay, Bradwell, Chapelcross, Harwell, Hunterston A, Trawsfynydd and Windscale.	Site specific report. SEA baseline 2009

Non-radioactive Contamination

There are also some non-radioactive contaminants on nuclear industry sites. The most common of these are hydrocarbons (e.g. diesel) and industrial solvents. To a lesser extent there are heavy metals, asbestos, poly-aromatic hydrocarbons, dioxins and furans.

Table D.10 Non-radioactive contamination baseline

Source of Discharge	Discharge	Data source(s)
Hydrocarbon fuels		
Losses and spillages of hydrocarbons during the operational phases and from authorised disposal.	Such spillages are generally localised. At Trawsfnydd there has been some oil spillage due to a leaking drain but an oil interceptor is in place. At Harwell, where waste chemicals had been stored in shallow unlined pits on site, contamination has spread to 8km.	Site specific reports.
Treatment Processes		
Spillage and leakage of chemicals used for treatment.	Previous spills of chemicals such as industrial solvents and acids have caused contamination.	Site specific reports.
Waste Storage and Disposal		
Historic disposal of	Industrial solvents have previously been disposed of to ground at some sites e.g. Chapelcross, Capenhurst, Dounreay, Sellafield and Winfrith. At Harwell, the industrial solvents have migrated up to 8km from site but hydraulic containment is ongoing.	Site specific reports.

Groundwater Bodies

The rocks under all sites on the Scottish mainland are designated as groundwater bodies in the context of the Water Framework Directive and are drinking water protected areas. For the sites in England and Wales, the majority are located above either minor aquifers or non-aquifers. In the new (post 2010) aquifer designations these are classified as secondary A and secondary B aquifers respectively. Secondary A aquifers support water supplies at a local rather than strategic scale. Nuclear industry sites which are located above a principal aquifer (previously designated as major aquifer due to high level of water storage) are:

- Amersham GE Healthcare
- Capenhurst
- Harwell
- Heysham (1 and 2)
- LLWR
- Sizewell
- Sellafield (including CLESA landfill).

Three of the LLW management sites are located above a principal aquifer including:

- Clifton Marsh (Landfill)
- ENRMF (Landfill)
- Ellesmere Port (Incinerator)

Groundwater monitoring programmes are in place across the majority of sites. Monitoring of the groundwater in the geology underlying Sellafield has shown radioactive contamination of the groundwater both within and beyond the 'separation area' at levels exceeding World Health Organisation guidelines for drinking water (Sellafield Ltd: Groundwater Monitoring at Sellafield: Annual Data Review, 2012; Sellafield Ltd: Land Quality Report, 2012). Elsewhere groundwater contamination is being managed at Dounreay, Hinkley Point and Oldbury to ensure it is not migrating. There is evidence of slight groundwater contamination at the LLW Repository, originating from historic disposal of LLW in trenches, a practice discontinued in the early 1990s. Control measures have been put in place to stop or slow down this transfer from the trenches (RIFE 2012) and there is no evidence that any such transfer has taken place from the waste disposed of in concrete vaults since the early 1990s.

A number of the sites are in close proximity to water abstraction licenses. Aside from those which allow abstraction for the sites themselves, these licenses are for either agricultural use, e.g. irrigation, or for public water supply. Regional samples of drinking water sources were representative of natural waters before treatment and supply to the public water system. The highest value was found near to Chapelcross nuclear licensed site, and this has since been investigated (Source: Cefas (2013) RIFE 2012).

Geology

The island of Anglesey, where Wylfa is situated, is a designated UNESCO (United Nations Educational, Scientific and Cultural Organisation) Geopark. Geoparks are areas with outstanding geological heritage and as such there is considerable effort to conserve this heritage and encourage its enjoyment and understanding by the public. There are several geological SSSIs within 2km of nuclear industry sites.

Surface Water Resources and Quality

This objective refers to the quality of surface water resources including lakes, rivers and marine waterbodies. It considers information relating to the contamination of surface water resources by both radiological and non-radiological means and the consumption patterns of water resources.

The surface water resources and quality baseline is relevant in relation to the following environmental and sustainability objectives:

- Air Quality
- Biodiversity, Flora and Fauna
- Geology, Ground and Groundwater Quality
- Global Climate Change and Energy
- Landscape and Visual
- Waste

Radioactive Discharges

The public dose limit for radiological discharges to the aquatic environment is set at 1mSv/y. This limit is set conservatively to provide protection to people and the environment. The dose rates associated with current liquid discharges from nuclear industry sites are significantly lower than the public dose limit for all sites. Only a small percentage of these discharges are derived from activities associated with LLW.

Table D.11 Radioactive discharges to the aquatic environment baseline

Source of Discharge	Discharge	Data source(s)
Waste storage and disposal		
Authorised discharges of leachate.	The critical group dose from discharges from the LLWR is less than 0.005mSv/y. Common nuclides discharged include beta, alpha, tritium, carbon-14 and krypton-85. The discharges of aqueous LLW at Dounreay were all less than 5% of the authorised limits. Landfill facilities are required to treat leachate on-site or transport to an off-site facility before discharge.	CEAS (2013) RIFE 2012. Site specific report.
Waste retrieval		
The retrieval of legacy waste	Discharges consist of short term peaks.	

Non-radioactive Discharges

There are limited liquid non-radioactive discharges associated with LLW, including some discharges from domestic operations such as drainage. Where there is leachate from disposed or stored LLW, this includes some contaminants which do not reach the radioactivity threshold required to qualify as radioactive.

Water Consumption

Most nuclear industry sites consume relatively large quantities of water, particularly operational generating power station sites. However this reduced by approximately 14% between 2005 and 2012. There is little information available relating to the consumption of water resources by activities associated with LLW. In 2007 the LLWR consumed 6,535m^3 of water. Some nuclear sites use water in their production and safety-related processes and equipment. This means that for these sites, the scope for reducing water use is limited to the small proportion of water not used in production or operational facilities such as offices. Most sites have water-use reduction plans and many have introduced water-saving initiatives. Many sites have also installed continuous water-use monitoring systems which are used to help with early identification of leaks as management of these is a crucial way that sites can reduce unnecessary water loss.

Water Resources

Under the Water Framework Directive (2000), the UK government is required to ensure that all surface waters are in 'good ecological condition' by a compliance date of 2015. As of 23 December 2013, 27% of water bodies in England complied with this requirement (DEFRA; https://www.gov.uk/government/policies/improving-water-quality).

Both the Water Framework Directive and the Bathing Water Directive (2006) places obligations on the UK government in respect of the quality of seawater adjacent to the coast. Where sites are located close to rivers or other terrestrial or marine water bodies, and water quality is monitored, the results indicate that water quality meets relevant UK and EU legislative targets. Discharges into the water environment are regulated under the Environmental Permitting (England and Wales) Regulations for England and Wales and under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 for Scotland (together with 2013 amendment regulations).

There are a number of water abstraction licenses in the vicinity of the nuclear sites. In some cases, such as Sellafield, these licenses are held by the NDA and used for operations on site. The licences near to other sites are used for agriculture and drinking water. These are monitored under the same regulations as discharges into the water environment.

Waste

This objective considers information relating to the generation, management, treatment and disposal of low level radioactive waste from the nuclear industry. It does not include aerial or liquid authorised discharges.

The waste quality baseline is relevant in relation to the following environmental and sustainability objectives:

- Air Quality
- Global Climate Change and Energy
- Landscape and Visual
- Surface Water Resources and Quality
- Traffic and Transport
- Waste

LLW Generation

According to the 2013 Waste Inventory, one million cubic metres of radioactive waste has already been disposed of. The total predicted volume of radioactive waste that exists or is forecast is approximately 4.5million cubic metres (4.9 million tonnes). Of this, 94% (4.2million cubic metres) is LLW (including VLLW). The major components of LLW are building rubble, soil and steel items such as framework, pipework and reinforcement from dismantling and demolishing of nuclear reactors and facilities. There is also LLW from the operation of nuclear facilities which includes paper, plastics and scrap metal.

Table D.12 Generation of nuclear waste baseline

Source of Waste	Waste Levels	Data source(s)
Operational nuclear sites		
Contaminated materials used during operations.	469,000m^3 (15%) of future arisings of LLW are from operations. These include paper, plastics and scrap metal. 63% of this waste is from Sellafield.	Waste Inventory 2013.
Site Decommissioning		
The decommissioning and demolition of reactors and ancillary plant generates LLW.	1.1million m^3 of future arisings are from decommissioning activities.	Waste Inventory 2013
Waste Retrieval		
Waste previously disposed at Dounreay to be repackaged and consigned to its new facility.	34,000 cubic metres of LLW is to be repackaged.	Waste inventory 2013
Secondary waste		
Waste generated from the treatment of LLW e.g. incineration generates residues, mineral fractions from metal treatment.	The secondary waste is a small proportion of the original waste treated e.g. incineration reduces the volume of waste for disposal by about 95%. Conditioned waste makes up 3% of the LLW currently held in the LLWR.	Waste inventory 2013

The information presented above is based on estimates of the quantity of waste which is anticipated to arise over more than 100 years. While considerable effort has been expended in producing these estimates there is a degree of uncertainty involved in such long-term predictions and in addition there is scope for future changes in waste generating activities and the legal framework for radioactive waste management to affect the nature and volume of waste which arises. Factors which may affect future waste arisings include:

- the potential development of new nuclear power stations within the UK;
- changes in the land quality strategies used for contaminated sites; and
- changes in the thresholds used to classify radioactive material.

LLW Management

There are a number of incinerators, high force compactors and metal recycling facilities available for the management of LLW. Typically nuclear industry sites have small scale sorting and size reduction equipment, monitoring facilities, low force compaction (e.g. in drum) and access to high force compaction. The widest available capacity for treatment of LLW is incineration, which resulted in 2,766m^3 of LLW from NDA sites being diverted from disposal

during the 2013/14 financial year. Three commercial sites are permitted for disposal of radioactive waste by incineration – at Ellesmere Port, Cheshire, in Colnbrook, Berkshire, and near Fawley, Southampton.

The Studsvik facility at Lillyhall, Sellafield and the Winfrith facility provide metal recycling services in the UK, and there are commercial facilities in Sweden, Germany and the USA which are also available for use by UK LLW waste producers.

Only two UK nuclear sites have authorised facilities for disposal of LLW waste. The largest of these is the main national repository in West Cumbria. A disposal site for LLW is now available adjacent to Dounreay, though only waste from the sites at Dounreay and Vulcan will be disposed of there. Landfills permitted for the disposal of radioactive waste include Clifton Marsh near Preston in Lancashire, Lillyhall landfill in Cumbria, and ENRMF in Northamptonshire. Sellafield Ltd also operates a landfill at Sellafield, known as CLESA, which takes low activity LLW from the site.

There is considerable uncertainty surrounding long-term waste routing projections. An indicative analysis of projected LLW disposal routes as declared by waste organisations in the 2013 inventory indicates that:

- About 124,000m^3 (9%) is expected to be recycled or incinerated;
- About 279,000m^3 (20%) is expected to go to landfill;
- About 473,000m^3 (35%) is expected to be disposed of to the LLW R or the Dounreay LLW disposal facility, with super-compaction of suitable waste;
- About 441,000m^3 (32%) is not expected to be disposed of to the LLWR. This is waste from final site clearance at nuclear power stations that will arise after the projected lifetime of the LLWR;
- About 10,500m^3 (1%) is unsuitable for disposal to the LLWR. This is predominantly Magnox and AGR core graphite; and
- About 40,000m^3 (3%) does not yet have a confirmed management route.

Non-radioactive Waste

Throughout the decommissioning process there will be various non-radioactive wastes generated, for example asbestos removed from the demolition of facilities. Non-radioactive waste generated through activities associated with the management and disposal of LLW is generally limited to that arising from the domestic operations of nuclear sites. Aerial and liquid discharges are covered in the baseline information for Air Quality and Surface Water Resources respectively. Many of the sites have environmental management systems which consider the disposal of non-radioactive waste.

Economy, Society and Skills

This objective considers information relating to the contribution that the nuclear sites make towards the economic prospects in the area, including educational and training opportunities.

The economy, society and skills baseline is relevant in relation to the following environmental and sustainability objectives:

- Traffic and Transport
- Land Use

Employment

In 2013, the nuclear industry sites employed over 27,000 people across the UK. This figure does not include those working at Rolls Royce Marine Power Operations Ltd or the personnel on the naval bases. Jobs associated with LLW make up a small proportion of this workforce.

Nuclear industry sites are generally located in geographically remote areas. Consequently a number of sites have become the dominant employer in the area, becoming strongly linked to its wider social and economic wellbeing. This is particularly acute in, though not exclusive to:

- West Cumbria
- Caithness and North Sutherland
- Anglesey and Meirionnydd
- The Gretna-Lockerbie-Annan corridor in Dumfries and Galloway.

In addition, the AWE facilities have been noted in the West Berkshire Core Strategy as employment sites which are strategically important for the district's economy. As many of the LLW management facilities are found in more urban areas and the facilities are smaller in scale, their influence on employment structure is less clear.

Investment

The nuclear decommissioning supply chain industry is valued at £3billion a year (HM Government, 2013). This contribution to the local economy varies between sites, with Sellafield alone estimated to spend £800million in the supply chain, with almost 30% retained in Cumbria, compared to Urenco at Capenhurst which is estimated to contribute £2million. The LLW Repository in West Cumbria estimates that 40% of the supply chain spend is retained in West Cumbria. This information was not available for several sites.

Skills

Skill levels vary between the locations of nuclear industry sites. The 2011 census revealed there is a general trend for communities surrounding nuclear sites to have a below average proportion of people with no qualifications or the highest level of qualifications (based on local authority level data). Over the last few years direct investment by the NDA has helped develop major skills and training facilities across the UK to address the deficit left by an estimated 70% of the nuclear industry's highly skilled workers retiring by 2025 (Source: HM Government (2013) The UK's Nuclear Future).

The NDA and the Site Licence Companies (SLCs) which operate its sites have provided support to the Nuclear Energy Skills Alliance to identify key skill areas where there is a risk of skills

shortages and which the NDA People Strategy should aim to address. The following skill priorities are deemed to be urgent: Project & Programme Managers, Construction Project Managers, Steel Fixing, High Integrity Welders, Safety Case Authors, Research & Development Personnel, Basic Requirements and Nuclear Awareness, Site/Construction Supervisors, Apprenticeships and Higher Level Apprenticeships. (NDA, 2014).

Some nuclear sites have their own processes and schemes in place to encourage the development of skills in the local workforce. There are several examples of partnerships with local educational institutions including a match funding scheme at LLWR Ltd and local apprenticeship programmes.

Community

The use of contractors on nuclear sites has consequences for the local community. In terms of housing, lettings are in high demand.

Traffic and Transport

This objective considers information relating to the transportation of people and goods by road and rail and, where relevant, by sea; to the implications of this transportation for road and rail traffic flows and the effects of those flows on the environment. This section includes the implications of transport activity on local communities in terms of volumes of activity on the road network.

The traffic and transport baseline is relevant in relation to the following environmental and sustainability objectives:

- Air Quality
- Global Climate Change and Energy
- Landscape and Visual
- Surface Water Resources and Quality
- Traffic and Transport
- Waste

Transport Movements

The primary means of travel to and from work by employees at nuclear industry sites is by car. This is primarily due to the sites' rural locations and the generally poor access by public transport to those sites. While this generally makes up a small proportion of travel on major routes to the sites, in some cases it can be significant at peak times of the day, e.g. at Sellafield. In terms of volume, the number of vehicles that travel to and from work for commuting purposes significantly exceeds the number of HGV movements for transporting materials and waste.

The number of ISO containers arriving at the LLW Repository has decreased in recent years, and for 2013 there were less than 300 received (LLW Repository plan 2013-2018). For Magnox sites it has been predicted that during the care and maintenance phase of decommissioning there will be between 5 and 30 movements per day for each site. It is not stated how many of these will be associated with activities related to LLW.

The distances between nuclear sites and the LLW Repository by road range from 6 miles (between LLWR and Sellafield) to 388 miles (from Dungeness to the LLWR). Dounreay is 418 miles to the north of LLWR, but has its own adjacent repository that it uses.

Transport Infrastructure

The majority of the transportation of LLW and supplies for associated activities are made by road. Rural sites are generally able to connect to the national strategic route without having to pass through the centre of any nearby settlements, although there are a number of exceptions. These include the LLW Repository, Hinkley Point and Berkeley.

The following sites are in close proximity to rail heads used for transporting waste and other materials:

- LLW Repository
- Culham JET
- Oldbury
- Heysham
- Trawsfynydd (though this has been disused since defueling at the site)
- Berkeley
- Bradwell
- Dounreay
- Dungeness
- Hinkley Point
- Sellafield
- Hunterston
- Torness

A total of 86% of waste containers arriving at the LLW Repository in the last financial year arrived by rail, with 14% by road. Of the 86% arriving by rail, the majority comes from Sellafield, having first travelled there by road over greatly varying distances. Approximately 10% of the containers travel directly by rail to the LLW Repository (Waste Metric Dashboard, 2014; LLWR Plan 2013-2018).

Most of the LLW management facilities are in close proximity to rail routes, many of which have rail heads or sidings; some sites may utilise these for waste transport.

Safety

The safety of radioactive substances is an important area of stakeholder interest. Social amplification of perceived risk can result in risks from LLW transport appearing to be more significant than an objective assessment would suggest. The transport of LLW is heavily regulated by the ONR and within this SEA the discharges to air during transport have been covered in the baseline for Air Quality objective.

Conventional road safety is an important national issue. In In 2012 over 1,700 people were killed in road traffic accidents and over 23,000 were seriously injured) (Royal Society for the Prevention of Accidents). In 2013 there were around 416 accidents involving HGVs per billion vehicle miles in the UK. This is almost half of the rate for all vehicles (824 per billion vehicle miles) but is an increase from the same statistic in 2010 (83 per billion vehicle miles) (source:

Department for Transport (DfT) Road Traffic Survey). There are no records for transport safety within the nuclear industry specifically.

Disturbance to communities

As mentioned above, the majority of rural sites can connect to the strategic road network without passing through the centre of nearby settlements. However, the existing road infrastructure has a finite capacity. DfT has published information to define the maximum capacity of eight categories of urban and rural road in terms of the number of vehicles that can use them per hour. The published information gives ranges between 950 vehicles per hour for some minor rural roads to 7,200 vehicles per hour for urban motorways. However, not all road types are covered – some motorways will have higher capacities, and many very small rural roads will have significantly smaller capacities than 950 vehicles per hour.

Land Use

This objective considers information relating to the land use surrounding nuclear industry sites. It also highlights the intended site end states.

The land use baseline is relevant in relation to the following environmental and sustainability objectives:

- Air Quality
- Global Climate Change and Energy
- Landscape and Visual
- Surface Water Resources and Quality
- Traffic and Transport
- Waste

Surrounding land use

As many of the nuclear industry sites are located in rural areas, surrounding land use is generally dominated by agricultural activities. Within the UK's rural areas, land use varies greatly on a local basis, but there are clear regional trends. There is a much higher proportion of arable farming in the east than in the west, with most of East Anglia and the area around the Wash almost entirely arable or devoted to other forms of intensive agriculture. To the west, there is much more grassland, although a high proportion of it is improved grassland, particularly in lowland areas; this is often cultivated for fodder or silage as much as for grazing. Upland areas, particularly in the north, the west and Wales, tend to have a high proportion of unimproved land used for extensive rather than intensive grazing, mainly for sheep, and large areas of forestry.

At Urenco Capenhurst, Hinkley Point, Hunsterston, Sizewell, Dungeness and Heysham there are other nuclear sites adjacent to the sites. Research facilities such as Harwell and Culham JET are within close proximity to science and technology parks and GE Healthcare Cardiff is within an industrial park. Several of the sites are located within operational dockyards. Waste management sites are also found within a range of land use types; commercial incinerator facilities are located predominantly in existing science and technology or industrial sites. Metal recycling and landfill facilities can be found on existing nuclear sites (Sellafield and Winfrith metal treatment, CLESA), agricultural land and woodland (ENRMF), industrial sites (Lillyhall MRF and landfill). Another notable use of land in proximity to sites is for recreation in the form of public footpaths and rights of way.

Site end states

The majority of sites are expected to be delicensed as part of the decommissioning process. The site end states for some sites are defined in the NDA Strategy Document (2011) and depend on the next planned use of the site and surrounding land, while for other sites the desired end state will be determined in due course.

Noise and Vibration

This objective considers information relating to the level of environmental noise and vibration in the ground resulting from activities on and around nuclear industry sites.

Noise in its widest sense can be defined as 'unwanted sound', and can come from industrial, agricultural, domestic, transportation or natural sources. Vibration is made up of oscillatory waves that pass through either the air or the ground to nearby buildings and can be caused by some industrial, construction or transportation activities.

In general, noise can propagate over much greater distances than vibration, which is generally only an issue at close range. Noise is measured in decibels (dB), an adjusted measure used to reflect the perceptions of the human ear. As a rule of thumb, noise from a point source reduces by 6dB with every doubling of distance, so that if the noise pressure is 60dB at 1m from the source, it will be 56dB at 2m, 48dB at 4m, 20dB at 100m, 14dB at 200m and 8dB at 400m.

Examples of typical noise levels for illustrative purposes might be:

- Breathing – about 10dB
- A whisper or rustling leaves – about 20dB
- A library or bird calls – about 40dB
- A quiet suburb, large electrical transformers at 30m – about 50dB
- Typical modern office, conversation in a restaurant – about 60dB
- Vacuum cleaner, TV or radio, car at 65mph at 8m distance – about 70dB
- Freight train at 15m distance – about 80dB
- Jet aircraft at one nautical mile, motorcycle at 8m, power lawnmower – about 90dB
- Outboard motor, jet aircraft taking off at 300m distance – about 100dB.

The noise and vibration baseline is relevant in relation to the following other objectives:

- Biodiversity, Flora and Fauna
- Traffic and Transport
- Economy, Society and Skills

There have been a limited number of complaints from members of local communities regarding noise at nuclear sites. These are generally related to for ventilation equipment and have been addressed appropriately. Due to the location of the incinerator facilities within existing industrial areas, noise and vibration are unlikely to exceed the levels produced by other industrial processes. Some noise and vibration may be possible from landfill sites due to the movement of heavy machinery; however LLW contributes a low proportion of total waste accepted at these sites and is therefore likely to contribute to noise and vibration in an equal proportion. Noise

receptors include schools, residential accommodation and sensitive species of wildlife. Noise is a localised issue and therefore location-specific receptors are not identified in this baseline. Potential sources of noise and vibration relating to activities associated with LLW are set out in the table below.

Table D.13 Noise and vibration baseline

Source of noise/vibration	Noise/Vibration levels	Data source(s)
Transportation		
The vehicles moving LLW and supplies between and within sites generation noise and vibration. The majority of these are HGVs, and there is some rail transport.	Noise and vibration levels are not recorded for transport activity.	Site specific reports.
Decommission and demolition		
The generation of LLW through decommissioning activities onsite can result in increased noise and vibration levels through use of heavy machinery.	The daytime average background noise levels from the site range from 38-66dB, dependent on location of receptor and activities on site. Vibrations caused by demolition are occasional, short term and localised.	Site specific reports
LLW storage and treatment		
The fans providing onsite ventilation and the grouting process both generate noise.	The actual levels are not noted but hearing protection is required in these areas.	LLWR Safety Case 2011
Ambient noise levels		
The majority of the sites are in rural locations; therefore the main sources of noise are wind generated noise, waves breaking and agriculture. In more urban areas sources include road and railway noise. Some sites are located adjacent to defence sites which may contribute artillery noise.	Ambient noise levels are not measured for the sites but existing noise levels provide context for the effects on local receptors.	Site specific reports.

List of Site Specific Reports.

The following site-specific reports were used in compiling this baseline information.

AWE (2013) Environment Safety Health and Quality Quarterly Report. http://www.awe.co.uk/publications_3732d1d.html

Dounreay Site Restoration Ltd (2014) Strategic Environmental Assessment Site Specific Baseline Dounreay http://www.dounreay.com/safety-and-environment/environment/corporate/environment-baseline

LLWR (2011) Environmental Safety Case http://llwrsite.com/national-repository/key-activities/esc/esc-documentation/

Magnox (2014) Berkeley Site Strategic Environmental Assessment Site Specific Baseline http://www.magnoxsites.co.uk/publications/

Magnox (2014) Bradwell Site Strategic Environmental Assessment Site Specific Baseline http://www.magnoxsites.co.uk/publications/

Magnox (2014) Chapelcross Site Strategic Environmental Assessment Site Specific Baseline http://www.magnoxsites.co.uk/publications/

Magnox (2014) Dungeness A Site Strategic Environmental Assessment Site Specific Baseline http://www.magnoxsites.co.uk/publications/

Magnox (2014) Hinkley Point A Site Strategic Environmental Assessment Site Specific Baseline http://www.magnoxsites.co.uk/publications/

Magnox (2014) Hunterston Site Strategic Environmental Assessment Site Specific Baseline http://www.magnoxsites.co.uk/publications/

Magnox (2014) Oldbury Site Strategic Environmental Assessment Site Specific Baseline http://www.magnoxsites.co.uk/publications/

Magnox (2014) Sizewell A Site Environmental Management Plan 2014/15 http://www.magnoxsites.co.uk/publications/

Magnox (2014) Trawsfynydd Site Strategic Environmental Assessment Site Specific Baseline http://www.magnoxsites.co.uk/publications/

Magnox (2014) Wylfa Site Strategic Environmental Assessment Site Specific Baseline http://www.magnoxsites.co.uk/publications/

Research Sites Restoration Ltd (2013) Strategic Environmental Assessment Site Specific Baseline RSRL Harwell. http://www.research-sites.com/UserFiles/File/Archive/Safety,%20Health%20and%20Environment/RSRL%20Harwell%20Strategic%20Environmental%20Assessment%20March%202013.pdf

Research Sites Restoration Ltd (2014) Strategic Environmental Assessment Site Specific Baseline RSRL Winfrith. http://www.research-sites.com/UserFiles/File/Archive/Safety,%20Health%20and%20Environment/RSRL%20Winfrith%20Strategic%20Environmental%20Assessment%20July%202014.pdf

Sellafield Ltd (2013) Strategic Environmental Assessment Site Specific Baseline Sellafield. http://sustainability.sellafieldsites.com/files/2012/12/Sellafield-Site-Specific-Information-2013-December-update-FINAL.pdf

Springfields Fuels Ltd (2011) Annual Environment Health and Safety Report 2010/2011 http://www.nuclearsites.co.uk/resources/upload/Springfields%20Annual%20EHS%20Report%202010-11.pdf

Studsvik (2011) Corporate Responsibility Report 2011.

Additional Sources of Information

Cefas (2013) Radioactivity In Food and the Environment, 2012. http://www.cefas.defra.gov.uk/publications-and-data/scientific-series/radioactivity-in-food-and-the-environment-(rife).aspx

DECC (2009) UK Strategy for Radioactive Discharges https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249884/uk_strategy_for_radioactive_discharges.pdf

DECC (2015) 2013 UK Greenhouse Gas Emissions, Final Figures – statistical release. https://www.gov.uk/government/statistics/final-uk-emissions-estimates

DEFRA and DECC (2014) UK Government Conversion Factors for company reporting. http://www.ukconversionfactorscarbonsmart.co.uk/

DfT (2009) Low Carbon Transport: A greener future. http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/pgr/sustainable/carbonreduction/low-carbon.pdf

DfT (2014) Road Traffic Survey https://www.gov.uk/government/organisations/department-for-transport/about/statistics

Environment Agency WIYBY mapping tool. http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

Environment Agency (2012) Nuclear Sector Plan 2012 Environmental Performance Report https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296762/LIT_8928_2430c2.pdf

HM Government (2013) The UK's Nuclear Future https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/168048/bis-13-627-nuclear-industrial-strategy-the-uks-nuclear-future.pdf

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LLWR Ltd (2014) Waste Metric Dashboard http://llwrsite.com/national-waste-programme/programme-management-arrangements/waste-metric-dashboard/

Magic mapping tool. http://www.magic.gov.uk/

The Met Office (2009) The UK Climate Projections 2009 (UKCP09) http://ukclimateprojections.metoffice.gov.uk/

NDA (2010) UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry http://www.nda.gov.uk/publication/uk-strategy-for-the-management-of-solid-low-level-radioactive-waste-from-the-nuclear-industry-august-2010/

NDA (2014) People and Skills Strategy http://www.nda.gov.uk/publication/people-and-skills-strategy/

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ONR (2013) A guide to nuclear regulation in the UK http://www.onr.org.uk/documents/a-guide-to-nuclear-regulation-in-the-uk.pdf

Royal Society of the Prevention of Accidents (2012) http://www.rospa.com/faqs/detail.aspx?faq=296

WNTI (2006) Radiation Dose Assessment for the Transport of Nuclear Fuel Cycle Materials http://www.wnti.co.uk/media/31656/IP8_EN_MAR13_V2.pdf

Appendix E – Impact assessment matrices

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Appendix E Table 1: Air quality

Air quality – minimise emissions of pollutant gases and particulates to the air and enhance air quality								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Decay storage prior to further treatment or disposal	Decay storage packaging and storage facilities would be designed to ensure containment of radioactive contaminants and that gaseous discharges are kept below regulatory limits. In the long term, waste removed from storage for further management will have lower levels of radioactive contamination and thus lower risk to air quality than it did prior to placement in storage. Therefore, the risk of impacts on local populations, wildlife habitats soils and water bodies is to some extent reduced. No change re non-radioactive air quality issues compared to management of the same waste without decay storage. It is assumed that decay storage would be provided at or near the source of the waste, although in principle it could be at regional facilities.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**+**
		Multiple local facilities	Y	New facilities required	Y	**0**	**0**	**+**
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	Decontamination involves physical or chemical processes for the separation of radioactive materials from the bulk of the waste, which is thus rendered non-radioactive. In principle these processes have the potential to release gases/odours or particulates into the air, affecting air quality. However, decontamination processes are carried out within suitable containment facilities and in accordance with regulatory requirements specified in site licenses etc. The resulting emissions are consequently negligible and have no significant effect. Decontamination facilities, mainly for metals, exist at several current NDA sites. It is assumed that decontamination would be carried out at the source of the waste. In the future, it is intended to expand decontamination capabilities to cover wider categories of materials including non-metallic wastes.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~

Air quality – minimise emissions of pollutant gases and particulates to the air and enhance air quality								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Reuse LLW to avoid consigning it as waste	Reuse may involve the disassembly of items such as plant and fittings, which could give rise to the release of particulates or gases, with potential effects on air quality. Any consequent release of radioactive gases or particulates could affect local populations and any local wildlife habitats or contaminate soils and water bodies. However, similar disassembly is likely to be required prior to the consignment of many such items as waste, so this does not necessarily represent a change in environmental risk as a result of the Strategy. Any such disassembly will take place in controlled conditions which would prevent any significant release to atmosphere. Such controls are essential in the first instance to protect worker safety. It is therefore very unlikely that any of the above effects at greater distance would occur. LLW designated for reuse will be appropriately packaged to ensure the containment of any radionuclides during storage and until reuse takes place. Reuse and reassembly will only take place under similar controlled conditions to disassembly and in circumstances where no release to atmosphere is likely. As a result, no significant impact is likely to occur. Reuse would involve disassembly at existing local facilities for reuse either in new facilities at the same site or at other, new local facilities. Reuse of soils and rubble may primarily be in the form of capping material or similar uses during the decommissioning of existing nuclear industry sites. Such activities could in principle give rise to emissions of dust which could affect air quality in the local area. However, this would be managed by standard construction site dust suppression measures, resulting in no significant impact.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	N	New facilities required	Y	~	~	~
		Multiple local facilities	Y			**0**	**0**	**0**
		International facilities	N			~	~	~

Air quality – minimise emissions of pollutant gases and particulates to the air and enhance air quality								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Recycle LLW after consignment as waste	Many recycling processes have no implications for air quality. However, melting/smelting or other thermal processes involved in the recycling of metals and potentially other materials could result in the release of radioactive discharges, particulates, volatile organic compounds (VOCs) and other pollutants, affecting air quality. Any consequent release of radioactive gases or particulates could affect local populations, and could also potentially affect any local wildlife habitats or contaminate soils and water bodies. However, all such activities will be subject to strict controls to limit emissions. A large proportion of emissions are likely to be removed by 'scrubbers' or filters within the stack at processing plants so as to meet statutory requirements. Nevertheless, the final effects remain uncertain as they are dependent on the specific process involved. The option is available now in respect of metals. New facilities would be required if recycling were to be extended beyond metallic wastes.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y	New facilities required	N	**?**	**?**	**?**
		Multiple local facilities	Y			**?**	**?**	**?**
		International facilities	N			~	~	~

Air quality – minimise emissions of pollutant gases and particulates to the air and enhance air quality								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Incineration of LLW to recover energy or reduce volume	Incinerators at existing nuclear industry sites (except Hartlepool) have closed due to new legal requirements on air quality. However, in addition to international facilities, the supply chain has provided new incinerator capacity elsewhere for the disposal of LLW / reduction of volume of LLW. The current commercially-provided incinerators are specialist facilities that burn LLW together with other hazardous or clinical waste, in relatively small volumes. None of them has the capacity to co-combust LLW with sufficiently large volumes of other waste for the cost-effective generation of electricity for return to the grid. However, at the Sandwich incinerator energy is recovered in the form of steam for circulation into the local area heating system. Incineration can result in an increase in the emission to air of radionuclides, VOCs, persistent organic compounds (POPs), other pollutants and particulate matter, although all emissions are strictly regulated. However, should energy recovery be pursued, co-combustion with municipal waste would be likely to result in a significant increase in both the quantity and range of non-radioactive pollutants in the gases produced by combustion. Any significant increase in emissions of such pollutants could have environmental effects for a number of receptor types, potentially affecting human health, biodiversity/flora/fauna, soil and water. However, all of the current incinerators operate to very strict emissions limits and monitoring requirements under their Environmental Permits. New expanded capacity would be required to implement this option and would be subject to appropriate conditions under new Permits. Stringent controls would be applied, including the provision of filters and scrubbers in the stacks, to ensure that these pollutants are within regulatory limits by the point of emission. The precise effects are uncertain without detailed knowledge of the thermal processes to be applied and the wastes to be treated.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	Y	New facilities required	Y	~	~	~
		International facilities	N			~	~	~

Air quality – minimise emissions of pollutant gases and particulates to the air and enhance air quality									
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Treatment or volume reduction of metallic LLW by melting	The UK has no facilities for melting metal wastes, but there is the potential to create such facilities, while overseas facilities are currently in use. These thermal processes can result in the emission to air of radionuclides, VOCs, other pollutants and particulate matter. Any consequent release of such pollutants could affect local populations, and could also potentially affect any local wildlife habitats or contaminate soils and water bodies. However, any such thermal treatment processes are strictly governed by conditions under Environmental Permits as outlined under the previous option and this is likely to prevent any significant impact on the environment. Any development of new facilities in the UK to replace the use of overseas facilities would reduce emissions associated with transport.	Single national facility near Sellafield	Y	Option is available now	Y	?	?	?
		Single national facility not near Sellafield	Y			?	?	?
		Small number of regional facilities	Y			?	?	?
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			?	?	?
Volume reduction by compaction	Compaction is carried out using hydraulic presses, within a sealed compartment, and the LLW is packaged to prevent any escape of waste. It is therefore envisaged that there is no effect on air quality. This is an existing process and does not represent a change.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			0	0	0
		Multiple local facilities	Y	New facilities required	N	0	0	0
		International facilities	N			~	~	~

Air quality – minimise emissions of pollutant gases and particulates to the air and enhance air quality								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal at the LLW Repository	Prior to first implementation of the Strategy, the continuation of existing disposal practices at the LLW Repository implied a potential lifetime up to around 2037. However, as a result of the successful implementation of the Strategy in its first five years, approximately 86%[1] of LLW is now being diverted to other management/disposal routes and as a result no clear end date is predicted for the capacity available at the LLW Repository. Continued use of the LLW Repository as at present would require the continued excavation/ construction of new vaults at the LLW Repository. No significant emissions to air are expected as a result of this process. In any event, this would represent a continuation of existing practices and would not therefore represent a change due to the Strategy. The optimisation of packaging practices for waste prior to despatch to the LLW Repository for disposal is unlikely to result in any significant change in emissions to air, as all relevant activities would be subject to effective containment. In the very long term (many hundreds of years) climate change, through coastal erosion or other mechanisms, could affect the physical integrity of the LLW Repository, resulting in the release of airborne radioactive particles. This risk is addressed in the site's Environmental Safety Case and is believed to have been reduced to the lowest practicable level.	Single national facility near Sellafield	Y	Option is available now	Y	**0**	**0**	**?**
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N	New facilities required	N	~	~	~
		Multiple local facilities	N			~	~	~
		International facilities	N			~	~	~

[1] Figures for 2013-14; up from around 2% in 2009-10. http://llwrsite.com/wp-content/uploads/2013/04/NWP-Strategic-Review-2013-Issue-2-May-2014.pdf

Air quality – minimise emissions of pollutant gases and particulates to the air and enhance air quality									
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal of LLW at landfill sites	Three landfill sites are now in operation at which LLW is co-disposed with conventional waste. The co-disposal of LLW with other waste in landfill sites is undertaken with suitable controls to prevent the release of particulate material or other contaminants from the waste in the short to medium term. The emission of gaseous decay products is largely unaffected by package form and so there is unlikely to be a significant difference in such emissions from disposal in engineered facilities such as the LLW Repository. In the long or very long term (hundreds of years), waste packages held in non-engineered facilities are potentially more vulnerable to the effects of natural processes such as erosion and weathering and less resilient to climate change effects, and there is an increased risk that these could result in the release of contaminants to air in the form of gases or particulates. While there is a high probability that on such timescales radioactive decay would have significantly reduced any potential for radioactive contamination, it is not eliminated and other conventional contaminants could be released. Coastal sites or other sites particularly exposed to erosive forces may be particularly vulnerable. Any such release could in principle affect the health of local populations, wildlife habitats, soils and water bodies.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y	New facilities required	N	0	0	-
		Multiple local facilities	Y			0	0	-
		International facilities	N			~	~	~
Disposal of LLW at non-engineered surface facilities	Non-engineered facilities could include dedicated landfill-style disposal facilities, in-situ disposal or novel forms of disposal. In-situ disposal minimises the risk of emissions to air in the short to medium term as it avoids or minimises the disturbance of the LLW concerned; effectively it is left in place and contained where it is. Other forms of disposal of LLW in dedicated non-engineered facilities would be, in effect, very similar to disposal to landfill and environmental risks would be very similar. In the long or very long term (hundreds of years), waste packages held in non-engineered facilities would be subject to the same risks as those	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N	New facilities required	Y	~	~	~
		Multiple local facilities	Y			0	0	-

Air quality – minimise emissions of pollutant gases and particulates to the air and enhance air quality								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
	outlined above for waste disposed to landfill. However, in some cases, particularly where the material used is VLLW, the material may decay within the timescales quoted to a level where it is no longer classified as radioactive waste.	International facilities	N			~	~	~
Deep disposal of long-lived LLW in a Geological Disposal Facility (GDF)	Co-disposal of LLW with intermediate level waste (ILW) in a GDF implies burial at a depth of between 200m and 1000m below ground. The form of packaging and the method and depth of burial mean that the likelihood of any increase in emissions to air as a result of adopting this option is effectively none. This method of disposal is likely to be the most robust/resilient disposal method in relation to long-term natural/geographic changes and the effects of climate change.	Single national facility near Sellafield	N	Option is available now	N	**0**	**0**	**0**
		Single national facility not near Sellafield	Y			**0**	**0**	**0**
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	Y	~	~	~
		International facilities	N			~	~	~

Appendix E Table 2: Global climate change and energy

Global climate change and energy – minimise detrimental effects on the climate from greenhouse gases and increase resilience and adaptability to climate change								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Decay storage prior to further treatment or disposal	This option entails either the construction of new storage facilities or the adaptation and reuse of existing facilities, if they are considered suitable. There may be small-scale initial emissions associated with construction, but long-term storage is a low-energy process and therefore overall the greenhouse gas emissions associated with this option would be low. Decay storage would not remove the need for eventual management or disposal of the waste. However, the reduction in the level of radioactivity may enable a wider choice of management options, including greater use of recycling, resulting in savings in greenhouse gas emissions. In addition, decay storage would have much lower greenhouse gas emissions than most active decontamination techniques. It is assumed that the waste will be stored in a passively safe state and will not require active controls such as ventilation. Decay storage is unlikely to have a significant effect on long-term resilience or adaptability to climate change, depending on the intended duration of storage. Coastal sites or those on low-lying ground may be more vulnerable than those located inland or on raised ground.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**+**
		Multiple local facilities	Y	New facilities required	Y	**0**	**0**	**+**
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	Decontamination activities are often energy-intensive, and the maintenance of safe working areas (e.g. through ventilation and the filtering of air) uses additional energy. The increased implementation of decontamination is therefore likely to result in increased greenhouse gas emissions in the short to medium term due to energy consumption, mainly from the National Grid. This will decline in the longer term as it is anticipated that most or all new LLW needing treatment will arise in the short to medium term (say, within 100 years). It is unlikely that this option would contribute either positively or negatively to resilience or adaptability to long-term climate change.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**-**	**-**	**0**
		Multiple local facilities	Y	New facilities required	N	**-**	**-**	**0**
		International facilities	N			~	~	~

Global climate change and energy – minimise detrimental effects on the climate from greenhouse gases and increase resilience and adaptability to climate change									
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Reuse LLW to avoid consigning it as waste	In the medium to long term, reuse of LLW would result in energy savings compared to the treatment and/or management of the materials as waste and the manufacture of new items for use. In the short term, any such savings would be offset at least in part by the energy involved in dismantling, packaging and handling the waste in advance of reuse, including any containment requirements and ventilation etc. during the dismantling process. However, this is a small fraction of the energy involved in the production of virgin materials, so the effect remains beneficial on all timescales. It is unlikely that this option would contribute either positively or negatively to resilience or adaptability to long-term climate change.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	+	++	++
		International facilities	N			~	~	~
Recycle LLW after consignment as waste	Recycling of metallic LLW is primarily achieved first through decontamination, and secondarily through melting/smelting in combination with non-radioactive metallic wastes. These are energy-intensive processes and result in significant emissions of greenhouse gases, through combustion of fossil fuels or through use of energy from the National Grid. At a local level, this would increase greenhouse gas emissions. However, recycled metallic wastes would replace the use of virgin metals manufactured from ores. Recycling steel can save up to 75% of the energy used for manufacture of virgin steel. At a global level, therefore, the effect is considered beneficial at all timescales. The energy demands for recycling other materials are likely to be significantly lower, but the energy balance between recycled LLW and alternative materials is not always so clear. The assessment here is therefore based on metallic wastes. It is unlikely that this option would contribute either positively or negatively to resilience or adaptability to long-term climate change.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			+	++	++
		Multiple local facilities	Y	New facilities required	N	+	++	++
		International facilities	N			~	~	~

Global climate change and energy – minimise detrimental effects on the climate from greenhouse gases and increase resilience and adaptability to climate change								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Incineration of LLW to recover energy or reduce volume	Incinerators at existing nuclear industry sites have closed due to new legal requirements on air quality. However, the supply chain has provided new incinerator capacity elsewhere for the disposal of LLW / reduction of volume of LLW. None of the current incinerator provision has the capacity to co-combust LLW with other waste for the generation of energy, and it is considered unlikely that this option will be pursued. In general, incineration to reduce volume is an energy-intensive process and would generate increased greenhouse gas emissions both through the use of energy and directly from the incinerated waste. However, total incineration makes up a very small proportion of the total UK greenhouse gas emissions. In addition, relative to total waste generation in the UK, the quantities of relevance to LLW would be small. As such, the effects would be negligible. It is unlikely that this option would contribute either positively or negatively to resilience or adaptability to long-term climate change.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~
Treatment or volume reduction of metallic LLW by melting	Melting metallic wastes to reduce volume is an energy intensive, high-temperature thermal process and would result in significant increases in greenhouse gases, compounded by the fact that it is carried out only at international facilities and therefore requires bulk transport. It is unlikely that this option would contribute either positively or negatively to resilience or adaptability to long-term climate change.	Single national facility near Sellafield	Y	Option is available now	Y	- -	- -	- -
		Single national facility not near Sellafield	Y			- -	- -	- -
		Small number of regional facilities	Y			- -	- -	- -
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			- -	- -	- -

Global climate change and energy – minimise detrimental effects on the climate from greenhouse gases and increase resilience and adaptability to climate change								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Volume reduction by compaction	Compaction is an energy intensive process due to the requirement for high-force hydraulic systems and ventilation to maintain a safe working environment. Operation of compaction systems is therefore likely to increase emissions of greenhouse gases compared to disposal of non-compacted wastes, although there may be marginal offsetting savings through improved efficiency in transport and disposal. This is an existing process carried out on multiple sites in the UK. It is unlikely that this option would contribute either positively or negatively to resilience or adaptability to long-term climate change.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y	New facilities required	N	-	-	-
		Multiple local facilities	Y			-	-	-
		International facilities	N			~	~	~
Disposal at the LLW Repository	Continued use of the existing LLW Repository could be achieved either using similar packaging practices to those currently in use, or alternative package forms designed to maximise packaging efficiency and minimise the use of resources. The continuation of existing practices would be neutral in climate change terms. If alternative package forms are used, there may be the opportunity for some savings in greenhouse gas emissions due to reduced embodied carbon in the materials used, but whether significant savings can be achieved remains uncertain until the details of the packaging design are known. There is the potential for alternative packaging designs to be less resilient if exposed to long-term environmental change, including the long-term effects of climate change, but this remains uncertain until the packaging design is known.	Single national facility near Sellafield	Y	Option is available now	Y	?	?	?
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~

Global climate change and energy – minimise detrimental effects on the climate from greenhouse gases and increase resilience and adaptability to climate change									
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal of LLW at landfill sites	Co-disposal of LLW with other waste at landfill sites is likely to use less energy than disposal at engineered facilities such as the LLW Repository, as there would be no need to prepare engineered vaults, reducing the energy used in site preparation and avoiding the embodied carbon in the vault construction materials. Landfill sites are likely to be significantly less resilient to long-term environmental change, including the effects of climate change, than engineered facilities, on timescales of hundreds of years or longer, and this could affect the containment performance required of such a facility. Coastal sites, sites near rivers or sites otherwise open to erosive forces or inundation may be particularly vulnerable. However, if this factor is given consideration in site selection and permitting to ensure that the site can demonstrate a case for long-term stability then significant concerns should not arise.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			+	+	+
		Multiple local facilities	Y	New facilities required	N	+	+	+
		International facilities	N			~	~	~
Disposal of LLW at non-engineered surface facilities	This approach includes the disposal of LLW at dedicated landfill-style facilities, which would have similar benefits to co-disposal with other waste at other landfill sites, perhaps with slightly reduced efficiency due to the need for dedicated site management infrastructure. The same comments would apply with regard to long-term resilience. Where isolation/containment of bulk soils or other materials in situ is used as an alternative to removal and treatment or disposal of the materials as waste, it is assumed here that the direct energy use and the embodied carbon in materials required for containment in situ is less than would be required for excavating the waste and treating it and/or packaging it for transport and disposal elsewhere. There would therefore be significant savings in greenhouse gas emissions. Waste contained in situ in such a manner may be particularly vulnerable to long-term environmental change, including the effects of climate change, as site location and conditions may restrict engineering options and there is only so much that can be done without moving the actual waste. This may restrict the applicability of this option to sites that are not considered vulnerable to erosive forces.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	+	+	+
		International facilities	N			~	~	~

Global climate change and energy – minimise detrimental effects on the climate from greenhouse gases and increase resilience and adaptability to climate change								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Deep disposal of long-lived LLW in a Geological Disposal Facility (GDF)	Disposal of LLW in a GDF rather than in the LLW Repository may entail slightly higher carbon emissions, but any difference is likely to be marginal. In the long term, a GDF is the most resilient option disposal in relation to long term environmental change, including the effects of climate change, at the surface. Any waste would be sealed at such depth that it is considered to be effectively impervious to erosive forces, flooding, extreme weather events or similar effects.	Single national facility near Sellafield	Y	Option is available now	N	0	0	+
		Single national facility not near Sellafield	Y			**0**	**0**	**+**
		Small number of regional facilities	N	New facilities required	Y	~	~	~
		Multiple local facilities	N			~	~	~
		International facilities	N			~	~	~

Appendix E Table 3: Biodiversity, flora and fauna

Biodiversity, flora and fauna – protect and enhance habitats and species and promote opportunities to conserve and enhance wildlife (includes terrestrial, freshwater and marine habitats and wildlife)								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Decay storage prior to further treatment or disposal	Decay storage is most likely to be applied to relatively small quantities of waste, potentially making use of existing storage facilities rather than purpose-built facilities, on existing nuclear industry sites. Under such circumstances, any risk of impact to biodiversity, flora and fauna or to designated or undesignated habitats would be highly site-specific and would potentially be open to avoidance or mitigation by careful selection of the location of the storage facility within the overall area of the relevant nuclear industry site. Decay storage is only relevant to the short to medium terms, as in the long term the waste would be disposed of or managed elsewhere.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	~
		Multiple local facilities	Y	New facilities required	Y	**0**	**0**	~
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	In most cases it is considered unlikely that decontamination activities would add significantly to the disturbance of habitats or wildlife already created by decommissioning at nuclear industry sites. However, depending on the sensitivity of the location, construction and operation any new decontamination plant for metallic or other LLW (whether at a nuclear industry site or a waste management site) could create additional impacts on wildlife and habitats as a result of construction activities, noise, land-take or other effects. The occurrence of such impacts cannot be confirmed without site specific assessment at project level. It is assumed that any emissions of radioactive or other gases or particulates to air would be controlled under any facility's Environmental Permit such that there would be no significant impact on designated or otherwise sensitive habitats.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	Y	New facilities required	N	**?**	**?**	**?**
		International facilities	N			~	~	~

Biodiversity, flora and fauna – protect and enhance habitats and species and promote opportunities to conserve and enhance wildlife (includes terrestrial, freshwater and marine habitats and wildlife)								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Reuse LLW to avoid consigning it as waste	The reuse of material that remains radioactive would be limited to circumstances that do not create a potential for an increase in exposure to radiation for human populations. In many cases this will also imply circumstances that do not imply an increase in exposure to wildlife or habitats. However, there remain potential applications such as the reuse of lightly contaminated soils or rubble in landscaping or infill works that could affect adjacent habitats or wildlife populations. Such effects may be open to avoidance or mitigation but could only be identified at a site-specific level at Environmental Impact Assessment stage.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	**?**	?	?
		International facilities	N			~	~	~
Recycle LLW after consignment as waste	In general, LLW intended for recycling will have been subject to decontamination in advance of recycling. There should therefore be no significant additional risk of exposure of wildlife or habitats to radioactivity as a result of the use of recycled materials from LLW. In most cases, after decontamination (dealt with separately), any effects of recycling materials on biodiversity may be less than those of manufacturing virgin materials to enter the open market. However, on a precautionary basis, this assessment assumes they enter on a level field.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			0	0	0
		Multiple local facilities	Y	New facilities required	N	0	0	0
		International facilities	N			~	~	~

Biodiversity, flora and fauna – protect and enhance habitats and species and promote opportunities to conserve and enhance wildlife (includes terrestrial, freshwater and marine habitats and wildlife)								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Incineration of LLW to recover energy or reduce volume	Incinerators at existing nuclear industry sites have closed due to new legal requirements on air quality. However, in addition to international facilities, the supply chain has provided new incinerator capacity elsewhere for the disposal of LLW / reduction of volume of LLW. Incineration can result in an increase in the emission to air of radionuclides, VOCs, persistent organic compounds (POPs), other pollutants and particulate matter, although all emissions are strictly regulated. However, co-combustion with municipal waste to enable recovery of energy is likely to result in a significant increase in both the quantity and range of non-radioactive pollutants in the gases produced by combustion. Any significant increase in emissions of such pollutants could affect sensitive habitats, including designated sites, and wildlife populations. However, all of the current incinerators operate to very strict emissions limits and monitoring requirements under their Environmental Permits. Any new expanded capacity would be required to implement this option and would be subject to appropriate conditions under new Permits. Stringent controls would be applied, including the provision of filters and scrubbers in the stacks, to ensure that these pollutants are within regulatory limits by the point of emission. The precise effects are uncertain without detailed knowledge of the thermal processes to be applied and the wastes to be treated.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~

Biodiversity, flora and fauna – protect and enhance habitats and species and promote opportunities to conserve and enhance wildlife (includes terrestrial, freshwater and marine habitats and wildlife)								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Treatment or volume reduction of metallic waste by melting	Any expansion of melting through the provision of melting facilities in the UK would entail the construction of a new industrial facility operating a high-temperature thermal process. There is in principle the potential for effects on biodiversity from emissions to air, land or water, although these emissions are as yet undefined and would be subject to strict regulation. There is also the potential for direct habitat loss and disturbance to wildlife, depending on location. No such project is currently proposed, but if it were to come forward it is likely to be subject to Environmental Impact Assessment and its site-specific impacts cannot be predicted here. Its emissions would be subject to strict limits under an Environmental Permit. Set against the impacts of any such new facility would be the elimination of the impacts of bulk transport of waste to and from international facilities by sea, including any effects on marine habitats and species from pollution by bulk transport ships.	Single national facility near Sellafield	Y	Option is available now	Y	**?**	**?**	**?**
		Single national facility not near Sellafield	Y			**?**	**?**	**?**
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			**?**	**?**	**?**
Volume reduction by compaction	Compaction is a well-established practice in the UK, in place since before the first publication of the Strategy. The continuation of existing practices will not imply any change in effects on biodiversity. Any expansion of compaction to additional locations is unlikely to significantly affect biodiversity. Compaction is carried out using hydraulic presses, within a sealed compartment, within existing nuclear industry sites, and the LLW is packaged to prevent any escape of waste.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			0	0	0
		Multiple local facilities	Y	New facilities required	N	0	0	0
		International facilities	N			~	~	~

Biodiversity, flora and fauna – protect and enhance habitats and species and promote opportunities to conserve and enhance wildlife (includes terrestrial, freshwater and marine habitats and wildlife)								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal at the LLW Repository	In the short to medium term, continued disposal of LLW at the LLW Repository is very unlikely to result in any significant change in risks to biodiversity, flora and fauna from the existing situation. In the very long term, the LLW Repository may be vulnerable to long-term environmental change, in particular coastal erosion. This could cause the release of radioactive and other contaminants into the environment, with marine habitats and wildlife being particularly at risk. This risk is compounded if LLW is disposed of at the LLW Repository without diversion to other waste management routes, as the quantity of waste present would be increased.	Single national facility near Sellafield	Y	Option is available now	Y	**0**	**0**	**- -**
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N	New facilities required	N	~	~	~
		Multiple local facilities	N			~	~	~
		International facilities	N			~	~	~

Biodiversity, flora and fauna – protect and enhance habitats and species and promote opportunities to conserve and enhance wildlife (includes terrestrial, freshwater and marine habitats and wildlife)								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal of LLW at landfill sites	Several landfill sites are currently in operation at which LLW is co-disposed with other waste. Only the lowest-activity categories of LLW (including but not limited to VLLW) are disposed in this manner. These wastes provide minimal doses of radiation. The dose limits and monitoring requirements under the environmental permits and environmental safety cases at all such landfill sites, combined with operational controls such as immediate covering up of all LLW packages with earth immediately on placement, mean that the risk of exposure of wildlife visiting the site to radiation is minimal. The site itself is designed to provide sufficient containment to prevent transfer of radioactive or other contaminants into neighbouring habitats. In the very long term, landfill sites are intrinsically less resilient to long-term environmental change than engineered facilities such as the LLW Repository. As such, there is an increased risk of contaminants being released into the environment due to erosive forces on a timescale of hundreds of years or more. The likelihood of occurrence of such an event, and its severity, could only be assessed on a site-specific basis.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y	New facilities required	N	**0**	**0**	**?**
		Multiple local facilities	Y			**0**	**0**	**?**
		International facilities	N			~	~	~

Biodiversity, flora and fauna – protect and enhance habitats and species and promote opportunities to conserve and enhance wildlife (includes terrestrial, freshwater and marine habitats and wildlife)								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal of LLW at non-engineered surface facilities	Disposal of low-activity LLW in landfill-style dedicated facilities would entail a similar low level of risk to co-disposal with other waste at other landfill sites as above. In situ disposal or other novel approaches would all be designed to meet the required guidance[2] and would include any containment required to meet that guidance. In general, such approaches would be adopted where moving the waste would pose a greater risk of mobilising contaminants than leaving it in situ, while the contaminants themselves are at a low level of activity. In the nature of things, all such waste would be located within the nuclear industry estate. However, there remains a limited risk of impact on adjacent habitats, potentially including designated sites, principally through the transport of contaminants by groundwater flowing through waste retained in-situ. This may be susceptible to prevention through further containment measures, and any impact is only identifiable and capable of assessment on a site-specific basis, through EIA. However, in some cases, particularly where the material used is VLLW, the material may decay within the timescales quoted to a level where it is no longer classified as radioactive waste.	Single national facility near Sellafield	N	Option is available now	Y			
		Single national facility not near Sellafield	N					
		Small number of regional facilities	N	New facilities required	N			
		Multiple local facilities	Y			?	?	?
		International facilities	N					
Deep disposal of long-lived LLW in a Geological Disposal Facility (GDF)	Disposal of LLW at depth in a GDF effectively removes it from any realistic potential for interaction with wildlife or habitats in the medium to long term, and is the most resilient option to the long-term effects of environmental change. A GDF is not relevant in the short term as it will not be available on that timescale.	Single national facility near Sellafield	Y	Option is available now	N	~	+	+
		Single national facility not near Sellafield	Y			~	**+**	**+**
		Small number of regional facilities	N			**~**	**~**	**~**
		Multiple local facilities	N	New facilities required	Y	**~**	**~**	**~**
		International facilities	N			**~**	**~**	**~**

[2] The 'Guidance on Requirements for Authorisation for Near-Surface Disposal Facilities for Solid Radioactive Wastes'

Appendix E Table 4: Landscape and visual

Landscape and visual – Protect and enhance landscape character, landscape quality and visual amenity. Includes specific consideration of seascapes.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Decay storage prior to further treatment or disposal	Decay storage is most likely to be applied to relatively small quantities of LLW, potentially making use of existing storage facilities rather than purpose-built facilities, on existing nuclear industry sites. In the event that new storage facilities are required, due to the small quantities of LLW involved the buildings are likely to be relatively small compared to other structures on most nuclear industry sites. Any such facilities would be constructed within the boundary of existing sites. In consequence, it is considered unlikely that any significant landscape, seascape or visual effects are likely to occur. Any minor impacts that do occur are likely to be susceptible to mitigation through sensitive design or screening measures on a site-specific basis. Decay storage is only relevant in the short to medium term; in the longer term the waste would be removed for disposal or management elsewhere.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	~
		Multiple local facilities	Y	New facilities required	Y	**0**	**0**	~
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	In most cases it is considered unlikely that decontamination activities would add significantly to the existing landscape, seascape or visual impact of any existing nuclear industry facility. Construction of any new decontamination facility within existing nuclear industry sites could in principle create landscape/seascape or visual impacts. However, in most cases such facilities are likely to be smaller than other existing structures on site and with careful location within the site the risks of a significant impact occurring are low. In the event of construction of similar new facilities at a waste management site, there may be a greater risk that significant landscape or visual impacts could occur. However, such impacts could	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	Y	New facilities required	N	**?**	**?**	**?**

Landscape and visual – Protect and enhance landscape character, landscape quality and visual amenity. Includes specific consideration of seascapes.									
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**			
						Short term	**Medium term**	**Long term**
	only be identified or assessed on a site-specific basis through Environmental Impact Assessment.	International facilities	N			~	~	~
Reuse LLW to avoid consigning it as waste	The reuse of LLW is unlikely to have any significant effect on the protection or enhancement of landscapes or seascapes or to have any significant visual impact. The reuse of any existing facilities for potential storage is also unlikely to have any significant impact as it would not be adding new detracting features to the landscape or taking away any valued features. Because this option does not involve either the creation of new features that might intrude on the landscape or views, or the removal of features that might form part of the landscape or of views, it is considered that there is no relationship between this option and the objective.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	Y			~	~	~
		Multiple local facilities	Y	New facilities required	N	~	~	~
		International facilities	N			~	~	~
Recycle LLW after consignment as waste	The recycling of LLW, if necessary after decontamination (dealt with separately), is similarly unlikely to have any significant effect on the protection or enhancement of landscapes or seascapes or to have any significant visual impact. The reuse of any existing facilities for potential storage is also unlikely to have any significant impact as it would not be adding new detracting features to the landscape or taking away any valued features. Because this option does not involve either the creation of new features that might intrude on the landscape or views, or the removal of features that might form part of the landscape or of views, it is considered that there is no relationship between this option and the objective.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			~	~	~
		Multiple local facilities	Y	New facilities required	N	~	~	~

Landscape and visual – Protect and enhance landscape character, landscape quality and visual amenity. Includes specific consideration of seascapes.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
		International facilities	N			~	~	~
Incineration of LLW to recover energy or reduce volume	There are currently three incinerator facilities in the UK licenced to treat solid LLW from the nuclear industry. Any expansion of this capacity has the potential to create significant adverse landscape and visual impacts associated with the construction and operation of new infrastructure, likely to include visually intrusive features such as large buildings and tall stacks. The potential degree of significance of impact and the occurrence of any impact on designated sites would vary depending on the location of any new facility. It is very unlikely that any such facility would affect access to or the quality or quantity of public open space, as the most likely sites are in industrial areas.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			--	--	--
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			--	--	--
Treatment or volume reduction of metallic waste by melting	Melting is currently carried out using overseas facilities, and there are no proposals for new UK plant. Any new proposal would imply the construction of a new facility with potentially visually intrusive features such as large buildings and a tall stack. The potential degree of significance of impact and the occurrence of any impact on designated sites would vary depending on the location of any new facility. It is unlikely that a new facility would affect access to or the quality or quantity of public open space, as it would probably be in industrial areas.	Single national facility near Sellafield	Y	Option is available now	Y	--	--	--
		Single national facility not near Sellafield	Y			--	--	--
		Small number of regional facilities	Y			--	--	--
		Multiple local facilities	N	New facilities required	N	~	~	~

Landscape and visual – Protect and enhance landscape character, landscape quality and visual amenity. Includes specific consideration of seascapes.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
		International facilities	Y			- -	- -	- -
Volume reduction by compaction	Low-force compaction is a well-established practice on some existing nuclear industry sites. If the practice were expanded, substantial new facilities are not required to accommodate it. It is therefore unlikely that any significant additional impact on landscapes, seascapes or visual intrusion would occur as a result of expanded compaction capacity. High force compaction takes place at two sites. Any proposal to expand this capability would require substantial new facilities at a nuclear industry or a waste management site. This raises the potential for some visual intrusion, depending on the location of the site.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			-	-	-
		Multiple local facilities	Y	New facilities required	N	0	0	0
		International facilities	N			~	~	~
Disposal at the LLW Repository	Continued use of the LLW Repository, either using existing packaging practices or alternative forms of packaging, will not change the landscape/seascape/visual impacts of the Repository, where the disposal vaults are constructed below ground. It does imply a requirement for packaging infrastructure at the source sites. However, in most cases the relevant LLW will simply be packaged at the source of the waste. Where a dedicated central packing area is required, this may simply be a covered area of hardstanding within the existing nuclear industry site, or a re-purposed existing building, as long as it can accommodate the entry and exit of the containers. Such facilities would be adequate for most packaging including low-force compaction. No significant landscape/seascape or visual impact is likely to arise from the provision of such facilities within existing nuclear industry sites. High force compaction is currently carried out at two sites (Sellafield and Winfrith). Any hypothetical proposal to expand this capability would imply the construction of substantial new facilities, either at a nuclear industry site or a waste management site. The potential	Single national facility near Sellafield	Y	Option is available now	Y	**0**	**0**	**0**
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	N	~	~	~

Landscape and visual – Protect and enhance landscape character, landscape quality and visual amenity. Includes specific consideration of seascapes.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
	impacts of such facilities are assessed under another strategic option ('reduce volume by melting or compaction').	International facilities	N			~	~	~
Disposal of LLW at landfill sites	Co-disposal of LLW with other waste at landfill sites entails occupying part of the landfill void with LLW. In consequence, to meet both the original municipal or other waste requirement together with the additional volume of LLW, the final landfill restoration plan would have to be altered, using higher final ground levels. In some cases this may be adverse, in others beneficial or neutral in landscape terms, but it is very unlikely to be a significant impact whatever the direction of change.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~
Disposal of LLW at non-engineered surface facilities	If taken forward, disposal of LLW in dedicated landfill-style facilities could use existing voids, newly excavated voids or land-raising techniques, and could be located within nuclear industry sites, adjacent to them or elsewhere. This means that, depending on the location of the site and the technique adopted, there is the potential for the loss of valued landscape features, impacts on landscape/seascape character, visual intrusion and impacts on designated landscapes. The actual occurrence of such impacts can only be confirmed and assessed through the site-selection and EIA process. In situ disposal with appropriate containment is likely to require only very small-scale works; the principle of this method is that the waste is left in place. The likelihood of significant impact on landscapes/seascapes is therefore small. The assessment here is based on dedicated landfill-style facilities.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	-	-	-
		International facilities	N			~	~	~

Landscape and visual – Protect and enhance landscape character, landscape quality and visual amenity. Includes specific consideration of seascapes.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Deep disposal of long-lived LLW in a Geological Disposal Facility (GDF)	Disposal of LLW in a GDF places it at depths of between 200m and 1km below ground, in a facility being constructed principally to accommodate higher activity waste. There would therefore be no additional landscape or visual impact attributable to the disposal of LLW in a GDF. Use of a GDF is not relevant in the short term as such a facility will not be available on that timescale.	Single national facility near Sellafield	Y	Option is available now	N	~	~	~
		Single national facility not near Sellafield	Y			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	Y	~	~	~
		International facilities	N			~	~	~

Appendix E Table 5: Cultural heritage

Cultural heritage – Protect and, where appropriate, enhance the historic environment including historic buildings, archaeological remains and historic landscapes								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Decay storage prior to further treatment or disposal	Decay storage is most likely to be applied to relatively small quantities of waste, potentially making use of existing storage facilities rather than purpose-built facilities, on existing nuclear industry sites. Under such circumstances, any risk of impact to archaeological remains or historic landscapes is absent. Historic buildings are only at risk if present within the relevant nuclear industry sites and any impact can be prevented by avoiding the use of such sites for decay storage. It is therefore considered that no significant impact is likely to arise. Decay storage is only relevant to the short to medium terms, as in the long term the waste would be disposed of or managed elsewhere.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	~
		Multiple local facilities	Y	New facilities required	Y	**0**	**0**	~
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	In most cases it is considered unlikely that decontamination activities would add significantly to any existing impacts on the setting of nearby heritage sites created by decommissioning at nuclear industry sites. However, depending on the sensitivity of the location, construction and operation any new decontamination plant for metallic or other LLW (whether at a nuclear industry site or a waste management site) could create additional impacts on heritage resources as a result of direct damage through land-take and construction activities works or through visual intrusion, noise and other changes to the historic setting. The occurrence of such impacts cannot be confirmed without site specific assessment at project level.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	Y	New facilities required	N	**?**	**?**	**?**
		International facilities	N			~	~	~

Cultural heritage – Protect and, where appropriate, enhance the historic environment including historic buildings, archaeological remains and historic landscapes									
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**			
						Short term	**Medium term**	**Long term**
Reuse LLW to avoid consigning it as waste	The reuse of LLW is considered to have little or no relationship with the cultural heritage topic. There is no source/pathway/receptor route for an impact to occur.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	~	~	~
		International facilities	N			~	~	~
Recycle LLW after consignment as waste	Consideration has been given to whether recycling activities could result in impacts on the historic setting of cultural heritage resources. However, this would be dependent on significant changes in the landscape setting of such sites, and the separate landscape assessment has determined that there is no potential for a significant impact. It is therefore considered that there is no relationship between this option and the objective, because there is no source/pathway/receptor route for an impact to occur.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			~	~	~
		Multiple local facilities	Y	New facilities required	N	~	~	~
		International facilities	N			~	~	~
Incineration of LLW to recover energy or reduce volume	Any potential expansion of the existing incinerator capacity would entail new construction of industrial facilities, with the potential for disturbance of archaeological remains, effects on historic landscapes and on historic buildings and on the historic setting of any nearby heritage resources, potentially including designated sites. However, this potential is highly site-specific; its actual occurrence and significance of any such impacts can only be determined during site-selection and subsequent EIA processes. At this stage therefore, the assessment remains very uncertain.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			?	?	?
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~

Cultural heritage – Protect and, where appropriate, enhance the historic environment including historic buildings, archaeological remains and historic landscapes								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Treatment or volume reduction of metallic waste by melting	Any expansion of melting through the provision of melting facilities in the UK would entail the construction of a new industrial facility. There would be the potential for the disturbance of buried archaeological remains (if present) and effects on the setting of nearby heritage sites, including designated site (if present), particularly given the visually intrusive character of such features as tall stacks. No such project is currently proposed, but if it were to come forward it is likely to be subject to Environmental Impact Assessment and its site-specific impacts cannot be predicted here.	Single national facility near Sellafield	Y	Option is available now	Y	**?**	**?**	**?**
		Single national facility not near Sellafield	Y			**?**	**?**	**?**
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			**?**	**?**	**?**
Volume reduction by compaction	Compaction is a well-established practice in the UK, in place since before the first publication of the Strategy. Continuation of existing practice or expansion of compaction to additional locations is unlikely to significantly affect cultural heritage. Compaction is carried out using hydraulic presses, within a sealed compartment, and is likely to be done within existing buildings.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~

Cultural heritage – Protect and, where appropriate, enhance the historic environment including historic buildings, archaeological remains and historic landscapes								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal at the LLW Repository	Continued disposal at the LLW Repository, irrespective of the approach to packaging adopted, is unlikely to significantly affect the risk of impacts to cultural heritage.	Single national facility near Sellafield	Y	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N	New facilities required	N	~	~	~
		Multiple local facilities	N			~	~	~
		International facilities	N			~	~	~
Disposal of LLW at landfill sites	Several landfill sites are currently in operation at which LLW is co-disposed with other waste. Only the lowest-activity categories of LLW (including but not limited to VLLW) are disposed in this manner. Co-disposal of LLW with other waste at landfill sites entails occupying part of the landfill void with LLW. In consequence, to meet both the original municipal or other waste requirement together with the additional volume of LLW, the final landfill restoration plan would have to be altered, using higher final ground levels. Consideration has been given to whether this could affect the historic setting of any existing heritage sites, if present. However, given that the landscape assessment of this issue has concluded that no significant impact is likely, it is considered unlikely that any significant heritage impact is likely either.	Single national facility near Sellafield	N	Option is available now		~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y	New facilities required		**0**	**0**	**0**
		Multiple local facilities	Y			**0**	**0**	**0**
		International facilities	N			~	~	~

Cultural heritage – Protect and, where appropriate, enhance the historic environment including historic buildings, archaeological remains and historic landscapes								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal of LLW at non-engineered surface facilities	If taken forward, disposal of LLW in dedicated landfill-style facilities could use existing voids, newly excavated voids or land-raising techniques, and could be located within nuclear industry sites, adjacent to them or elsewhere. This means that, depending on the location of the site and the technique adopted, there is the potential for the loss of archaeological remains or impacts on historic landscapes or other heritage features. The actual occurrence of such impacts can only be confirmed and assessed through the site-selection and EIA process. In-situ disposal with appropriate containment is likely to require only very small-scale works; the principle of this method is that the waste is left in place. The likelihood of significant impact on heritage features is therefore small. The assessment here is based on dedicated landfill-style facilities.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	-	-	-
		International facilities	N			~	~	~
Deep disposal of long-lived LLW in a Geological Disposal Facility (GDF)	Disposal of LLW in a GDF places it at depths of between 200m and 1km below ground, in a facility being constructed principally to accommodate higher activity waste. There would therefore be no cultural heritage impact attributable to the disposal of LLW in a GDF.	Single national facility near Sellafield	Y	Option is available now	N	~	~	~
		Single national facility not near Sellafield	Y			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	Y	~	~	~
		International facilities	N			~	~	~

Appendix E Table 6: Geology, ground and groundwater quality

Geology, ground and groundwater quality – Minimise or remove the detrimental impact and maintain, restore and enhance to establish or increase the positive impact on groundwater, soil function and quality and geological features.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Decay storage prior to further treatment or disposal	LLW designated for decay storage will be packaged to ensure that radionuclides are contained and housed in a surface facility, likely to be within an existing nuclear industry site. As all radionuclides and other contaminants will be contained in a surface facility, it is not envisaged that there would be any relationship with groundwater, soil function and quality and geological features would occur during storage. The aim of this option is to allow the radionuclides in the LLW to decay to the point where the waste achieves a lower activity classification, thereby opening a wider range of options for management, including options that would divert it from disposal to higher levels on the waste hierarchy. Once managed after disposal, therefore, it would either be diverted to routes that avoid a relationship with groundwater, soil function and geological features or would be disposed of at a lower activity level, reducing risk. There is therefore the potential for long-term benefit, although this could only be confirmed through site-specific assessment. This approach minimises the handling, movement and potential disposal of waste until it has achieved a lower risk category, which has potential knock-on benefits for human health and biodiversity.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**?**
		Multiple local facilities	Y	New facilities required	Y	**0**	**0**	**?**
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	Certain decontamination activities could in principle raise the risk of increased contamination of the ground or groundwater, particularly where chemical decontamination techniques are applied, as a result of accidental spillages of cleaning agents or decontamination products, which themselves may form a higher category of waste. However, all such activities are required to be carried out in accordance with strict legal requirements, including the strict provisions of relevant permits, which specify required preventative measures and containment measures. The strict application and enforcement of these measures means that, in practice, no significant impact is likely. Decontamination products may require disposal at the LLW Repository, decay storage, or long-term storage until a GDF is available.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~

Geology, ground and groundwater quality – Minimise or remove the detrimental impact and maintain, restore and enhance to establish or increase the positive impact on groundwater, soil function and quality and geological features.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Reuse LLW to avoid consigning it as waste	The reuse of LLW would be limited to circumstances where it could not increase the risk of exposure of human populations to radiation. In general this would mean that the potential for impacts to ground and groundwater quality are very limited. However, reuse could in some circumstances include such items as the reuse of slightly contaminated soils and rubble to fill voids or in other landscaping works on existing nuclear industry sites, as part of the decommissioning process. This means that there would be the potential for interaction between the reused materials and groundwater flows. The occurrence of such an impact and its potential severity could only be identified on a site-specific basis as part of an EIA process.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	**?**	**?**	**?**
		International facilities	N			~	~	~
Recycle LLW after consignment as waste	In general, waste designated for recycling is likely to have very low activity levels or to have been subject to decontamination in advance. The nature of recycling means that the materials concerned will be diverted from routes in which they could have a relationship with soils, geological features or groundwater. It is therefore anticipated that no significant effect would occur.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~

Geology, ground and groundwater quality – Minimise or remove the detrimental impact and maintain, restore and enhance to establish or increase the positive impact on groundwater, soil function and quality and geological features.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Incineration of LLW to recover energy or reduce volume	Incineration can result in an increase in the emission to air of radionuclides, volatile organic compounds (VOCs), persistent organic compounds (POPs), other pollutants and particulate matter, although all emissions are strictly regulated. However, co-combustion with municipal waste to enable recovery of energy is likely to result in a significant increase in both the quantity and range of non-radioactive pollutants in the gases produced by combustion. Any significant increase in emissions of some pollutants could adversely affect soil quality. However, all of the current incinerators operate to very strict emissions limits and monitoring requirements under their Environmental Permits. New expanded capacity would be required to implement this option and would be subject to appropriate conditions under new Permits. Stringent controls would be applied, including the provision of filters and scrubbers in the stacks, to ensure that these pollutants are within regulatory limits by the point of emission. The precise effects are uncertain without detailed knowledge of the thermal processes to be applied and the wastes to be treated. Any new expanded incinerator capacity would entail the construction of new industrial-scale plant, most likely through the supply chain and away from any existing nuclear industry site. Such construction works would have the potential for impacts on soils, ground and groundwater quality; however, the occurrence of significant effects could only be confirmed and assessed through environmental impact assessment. Any option that has the potential for new construction has the potential to cover up areas of ground, resulting in sterilisation of underlying mineral resources. However, incinerators are most likely to be built in industrial areas and do not take significant amounts of land; it is not therefore likely that a significant impact would occur.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~

Geology, ground and groundwater quality – Minimise or remove the detrimental impact and maintain, restore and enhance to establish or increase the positive impact on groundwater, soil function and quality and geological features.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Treatment or volume reduction of metallic waste by melting	Melting is currently carried out overseas. Any future proposal to expand melting through the provision of new capacity in the UK would entail the construction of new heavy industrial scale plant, with the potential for impacts on soils, ground and groundwater quality; however, the occurrence of significant effects could only be confirmed and assessed through environmental impact assessment. Melting is a high-temperature thermal process with the potential to produce gaseous and particulate emissions, which could affect soil quality. However, any new plant would be required to operate to strict controls, including the provision of filters etc. in stacks to ensure that these emissions are within regulatory limits. The precise effects are uncertain without detailed knowledge of the thermal processes to be applied and the wastes to be treated. Any option requiring new construction would cover up areas of ground, resulting in sterilisation of underlying mineral resources. However, melting facilities most likely to be built in industrial areas; it is therefore unlikely that a significant impact would occur.	Single national facility near Sellafield	Y	Option is available now	Y	?	?	?
		Single national facility not near Sellafield	Y			?	?	?
		Small number of regional facilities	Y			?	?	?
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			?	?	?
Volume reduction by compaction	Volume reduction by compaction is a well-established practice in the UK, and is unlikely to have any significant relationship with geology, ground and groundwater quality.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			~	~	~
		Multiple local facilities	Y	New facilities required	N	~	~	~
		International facilities	N			~	~	~

Geology, ground and groundwater quality – Minimise or remove the detrimental impact and maintain, restore and enhance to establish or increase the positive impact on groundwater, soil function and quality and geological features.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal at the LLW Repository	The LLW Repository is designed to be permeable in the long term, and the Repository is underlain by a principal aquifer in the bedrock and surrounded by secondary A aquifers in the superficial deposits. However, it is a requirement for facilities for the disposal of long-lived LLW that it can be demonstrated that no long-term detriment to the ground or groundwater would occur. This must be done on a site-specific basis in the context of permitting regulations. It is therefore considered unlikely that any significant impact would occur. Monitoring at the site has shown some evidence in the past of slight contamination of groundwater, derived from waste disposed in trenches prior to the early 1990s rather than concrete vaults as has been the case since that time, and does not imply that similar effects would occur from current disposal practices.	Single national facility near Sellafield	Y	Option is available now	Y	**0**	**0**	**0**
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~
Disposal of LLW at landfill sites	In principle, there is the potential for ground and groundwater quality to be affected by leachate from LLW disposed at landfill sites. However, it is a requirement, in the context of permitting regulations, that prior to acceptance of any LLW at such a facility for disposal, it can be demonstrated that no detrimental long-term effect would occur. This is likely to limit the type of LLW that can be disposed of at such sites to the lowest-activity categories of LLW (and this is the case at the three existing landfill sites licenced to receive LLW). In consequence, no significant impact may occur. Monitoring at Clifton Marsh landfill site shows some migration of radioactive tritium into the groundwater, but evidence shows that the dose of radioactivity to which the public may be exposed is a very small fraction of the annual public dose limit. No significant effect is therefore anticipated.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~
Disposal of LLW at non-engineered	If taken forward, disposal of LLW in dedicated landfill-style facilities could use existing voids, newly excavated voids or land-raising techniques, and could be located within nuclear industry sites, adjacent	Single national facility near Sellafield	N	Option is available now	Y	~	~	~

Geology, ground and groundwater quality – Minimise or remove the detrimental impact and maintain, restore and enhance to establish or increase the positive impact on groundwater, soil function and quality and geological features.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
surface facilities	to them or elsewhere. This means that, depending on the location of the site and the technique adopted, there is the potential for effects on geology, geological sites of interest, groundwater and groundwater quality. In-situ disposal with appropriate containment is likely to require only very small-scale works; the principle of this method is that the waste is left in place. However, there remains the potential for impacts on ground and groundwater quality due to leachate from the waste. However, in some cases, particularly where the material used is VLLW, the material may decay within the timescales quoted to a level where it is no longer classified as radioactive waste. The actual occurrence of impacts from either process can only be confirmed and assessed through the site-selection and EIA process. Either the development of dedicated landfill facilities or disposal in-situ has the potential to limit or prevent future exploitation of underlying mineral resources.	Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	**?**	**?**	**?**
		International facilities	N			~	~	~
Deep disposal of long-lived LLW in a Geological Disposal Facility (GDF)	Co-disposal of LLW with intermediate level waste (ILW) at depth in a GDF is unlikely to have any significant effects on soils, geology or groundwater. This is because the facility would be constructed principally for disposal of other, higher activity waste, to which any impact of construction could be attributed. The level of containment within the relevant part of the facility would be designed for ILW (other sections would be designed for higher activity waste) and would therefore exceed any requirements for LLW.	Single national facility near Sellafield	Y	Option is available now	N	**0**	**0**	**0**
		Single national facility not near Sellafield	Y			**0**	**0**	**0**
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	Y	~	~	~
		International facilities	N			~	~	~

Appendix E Table 7: Surface water resources and quality

Surface water resources and quality – minimise consumption of water resources and detrimental impact on surface water quality, enhancing it where appropriate. Protect the quality of near-shore coastal waters.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Decay storage prior to further treatment or disposal	LLW designated for decay storage will be packaged to ensure that radionuclides are contained and housed in a surface facility, likely to be within an existing nuclear industry site. As all radionuclides and other contaminants will be contained in a surface facility, it is not envisaged that there would be any relationship with surface water bodies would occur during storage. The aim of this option is to allow the radionuclides in the LLW to decay to the point where the waste achieves a lower activity classification, thereby opening a wider range of options for management, including options that would divert it from disposal to higher levels on the waste hierarchy. In consequence, if a proportion of this waste is diverted to reuse or recycling rather than disposal and the disposal fraction is at a lower level of activity than would otherwise have been the case, any residual risk associated with disposal of the waste has been reduced. The overall effect in the long term is therefore considered beneficial.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	+
		Multiple local facilities	Y	New facilities required	Y	**0**	**0**	**+**
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	Certain decontamination activities could in principle raise the risk of contamination of surface water bodies (if present in close proximity), particularly where chemical decontamination techniques are applied, as a result of accidental spillages. However, all such activities are carried out in accordance with strict legal requirements, including the detailed provisions of relevant permits, which specify required preventative measures and containment measures. The strict application and enforcement of these measures means that, in practice, no significant impact is likely. While some decontamination processes use large quantities of water, it is considered unlikely that the quantities are such that significant pressure would be placed on water resources. Such 'wet' decontamination processes also have the potential to affect the quality of discharges to water. However, these would be done within a rigorous regulatory regime and are unlikely to give rise to significant impacts on water quality.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~

Surface water resources and quality – minimise consumption of water resources and detrimental impact on surface water quality, enhancing it where appropriate. Protect the quality of near-shore coastal waters.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Reuse LLW to avoid consigning it as waste	The reuse of material that remains radioactive would be limited to circumstances that do not create a potential for an increase in exposure to radiation for human populations. In most cases this will also imply circumstances that do not imply the potential to affect surface water bodies. However, there remain potential applications such as the reuse of lightly contaminated soils or rubble in landscaping or infill works. Such applications do raise the possibility that overland or groundwater flows of water could carry radionuclides or other contaminants in to nearby water bodies. Such effects may be open to avoidance or mitigation but could only be identified at a site-specific level at EIA stage.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	**?**	**?**	**?**
		International facilities	N			~	~	~
Recycle LLW after consignment as waste	In general, LLW intended for recycling will have a very low activity rate or have been subject to decontamination (dealt with separately) in advance of recycling. The use of recycled materials derived from LLW in manufacture of new goods should have no increased risk of impact on surface water quality or resources than the manufacture of the same goods from virgin materials.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~

Surface water resources and quality – minimise consumption of water resources and detrimental impact on surface water quality, enhancing it where appropriate. Protect the quality of near-shore coastal waters.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Incineration of LLW to recover energy or reduce volume	Incinerators at existing nuclear industry sites have closed due to new legal requirements on air quality. However, in addition to international facilities, the supply chain has provided new incinerator capacity elsewhere for the disposal of LLW / reduction of volume of LLW. Incineration can result in an increase in the emission to air of radionuclides, volatile organic compounds (VOCs), persistent organic compounds (POPs), other pollutants and particulate matter, although all emissions are strictly regulated. Co-combustion with municipal waste to enable recovery of energy is likely to result in a significant increase in both the quantity and range of non-radioactive pollutants in the gases produced by combustion. Any significant increase in emissions of some pollutants could affect the quality of surface water bodies as pollutants settle out of the atmosphere. All of the current incinerators operate to very strict emissions limits and monitoring requirements under their Environmental Permits. Any new expanded capacity would be required to implement this option and would be subject to appropriate conditions under new Permits. Stringent controls would be applied, including the provision of filters and scrubbers in the stacks, to ensure that these pollutants are within regulatory limits by the point of emission. The precise effects are uncertain without detailed knowledge of the thermal processes to be applied and the wastes to be treated. Any expansion of incinerator capacity would entail the construction and operation of new industrial-scale thermal installations, with the potential to affect surface water bodies. Any relevant effects could only be confirmed in the context of site-specific Environmental Impact Assessment.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~

Surface water resources and quality – minimise consumption of water resources and detrimental impact on surface water quality, enhancing it where appropriate. Protect the quality of near-shore coastal waters.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Treatment or volume reduction of metallic waste by melting	Melting is currently carried out overseas as there are no appropriate facilities in the UK. Any expansion of melting through the provision of facilities in the UK would entail the construction of a new industrial facility operating a high-temperature thermal process, with the potential to affect the surface water environment both during construction and operation. Operational effects could arise due to emissions to water or indirectly through emissions to air or land. No such project is currently proposed, but if it were to come forward it is likely to be subject to Environmental Impact Assessment and its site-specific impacts cannot be predicted here. Its emissions would be subject to strict limits under an Environmental Permit. Local facilities assessed based on compaction, international facilities based on existing melting, others based on new melting facility.	Single national facility near Sellafield	Y	Option is available now	Y	**?**	**?**	**?**
		Single national facility not near Sellafield	Y			**?**	**?**	**?**
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	N	New facilities required	N	**~**	**~**	**~**
		International facilities	Y			**?**	**?**	**?**
Volume reduction by compaction	Compaction is a well-established practice in the UK. The continuation of existing practices will not alter effects on the surface water environment. Any expansion of compaction to additional locations is unlikely to significantly affect surface water environment. Compaction is carried out using hydraulic presses, within a sealed compartment, and the LLW is packaged to prevent any escape of waste.	Single national facility near Sellafield	N	Option is available now	Y	**~**	**~**	**~**
		Single national facility not near Sellafield	N			**~**	**~**	**~**
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			**~**	**~**	**~**

Surface water resources and quality – minimise consumption of water resources and detrimental impact on surface water quality, enhancing it where appropriate. Protect the quality of near-shore coastal waters.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal at the LLW Repository	In the short-medium term, continued disposal of LLW at the LLW Repository is very unlikely to result in any significant change in risks to the surface water environment from the existing situation. While existing grouting practices do use large quantities of water, the quantities are not sufficiently large to place significant pressure on water resources. It is envisaged that any alternative packaging would reduce the requirement for grout and therefore for water. There are no significant discharges to surface water or groundwater from the Repository. Although the facility is designed to be permeable in the long term, so in principle leachate could reach groundwater and subsequently surface waters, regulatory requirements are such that no significant impact is anticipated. However, on a precautionary principle, this is considered uncertain in the very long term.	Single national facility near Sellafield	Y	Option is available now	Y	**0**	**0**	**?**
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N	New facilities required	N	~	~	~
		Multiple local facilities	N			~	~	~
		International facilities	N			~	~	~

Surface water resources and quality – minimise consumption of water resources and detrimental impact on surface water quality, enhancing it where appropriate. Protect the quality of near-shore coastal waters.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal of LLW at landfill sites	Several landfill sites are currently in operation at which LLW is co-disposed with other waste. Only the lowest-activity categories of LLW (including but not limited to VLLW) are disposed in this manner. These wastes provide minimal doses of radiation. In principle, there is the potential for surface water bodies to be indirectly affected as a result of leachate from LLW entering groundwater. However, it is a requirement, in the context of permitting regulations, that prior to acceptance of any LLW at such a facility for disposal, it can be demonstrated that no detrimental long-term effect would occur. This is likely to limit the type of LLW that can be disposed of at such sites to the lowest-activity categories of LLW (and this is the case at the three existing landfill sites licenced to receive LLW). In consequence, no significant impact is expected on groundwater, and by extension on surface water bodies. In the very long term, landfill sites are intrinsically less resilient to long-term environmental change than engineered facilities such as the LLW Repository. As such, there is an increased risk of contaminants being released into the environment due to erosive forces on a timescale of hundreds of years or more. The likelihood of occurrence of such an event, and its severity, could only be assessed on a site-specific basis.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**?**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**?**
		International facilities	N			~	~	~
Disposal of LLW at non-engineered surface facilities	Disposal of LLW in dedicated landfill-style facilities could use existing voids, newly excavated voids or land-raising techniques, located within nuclear industry sites, adjacent to them or elsewhere. This means that, depending on the location of the site and the technique adopted, there is the potential for effects on the surface water environment, through the creation of new waste disposal sites. In-situ disposal is likely to require only very small-scale works; the principle of this method is that the waste is left in place. However, there remains the potential for surface water bodies to be indirectly affected as a result of leachate from LLW entering groundwater. The actual occurrence of impacts from either process can only be confirmed and assessed through the site-selection and EIA process.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	**?**	**?**	**?**
		International facilities	N					

Surface water resources and quality – minimise consumption of water resources and detrimental impact on surface water quality, enhancing it where appropriate. Protect the quality of near-shore coastal waters.									
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Deep disposal of long-lived LLW in a Geological Disposal Facility (GDF)	Co-disposal of LLW with intermediate level waste at depth in a GDF is unlikely to have any significant relationship with the surface water environment.	Single national facility near Sellafield	Y	Option is available now	N	~	~	~
		Single national facility not near Sellafield	Y			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	Y	~	~	~
		International facilities	N			~	~	~

Appendix E Table 9: Economy, society and skills

Economy, society and skills – Contribute to sustainable local economies and social well-being by enhancing the populations' skill base and contributing to employment opportunities, recognising workforce needs, thus supporting vibrant local economies.

How will the waste be managed?	Description of the impact	Where will the waste be managed? (options open for this management route)		When will the waste management route be available?		Impact		
						Short term	Medium term	Long term
Decay storage prior to further treatment or disposal	Decay storage is a largely passive form of treatment. Once packaged and placed in storage, other than routine monitoring the waste will require very little intervention until the time comes for it to be removed from storage and designated for other forms of management. It is therefore unlikely that decay storage would make any significant contribution either positively or negatively to local economies or to skills development.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			~	~	~
		Multiple local facilities	Y	New facilities required	Y	~	~	~
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	Decontamination would require employees/contractors with all levels of skills. This approach is likely to support continuity of employment as it is assumed that many current employees would remain at the nuclear sites where decommissioning will take place. It may also encourage research and development into new techniques, widening the skill base. The majority of decontamination is likely to take place at existing nuclear sites or facilities so this option is unlikely to have any impact on the sense of well-being in local communities.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			+	+	0
		Multiple local facilities	Y	New facilities required	N	+	+	0
		International facilities	N			~	~	~

Economy, society and skills – Contribute to sustainable local economies and social well-being by enhancing the populations' skill base and contributing to employment opportunities, recognising workforce needs, thus supporting vibrant local economies.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Reuse LLW to avoid consigning it as waste	It is expected that there will be a small number of employment opportunities created in the short and medium term in relation to reuse of LLW. However, it is unlikely to contribute to an increase in skills and skill development. This approach is unlikely to cause any effects relating to investment in local communities or community structure.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	N	New facilities required	N	~	~	~
		Multiple local facilities	Y			+	+	+
		International facilities	N			~	~	~
Recycle LLW after consignment as waste	Existing recycling facilities employ a small number of staff, the majority of which have trade skills and a few are specialists and/or managers. There are a number of existing facilities, in the UK and internationally, which may be required to expand if this approach is favoured, creating employment opportunities. While this expansion would contribute to the local economy, due to the small number of employees, it is unlikely to be significantly positive. Developing existing and additional metal recycling facilities has the potential to attract investment from similar industries in the local area, diversifying the local economy. Where current facilities exist there are a relatively high number of people with trade skills which could benefit from such opportunities.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y	New facilities required	N	+	+	+
		Multiple local facilities	Y			+	+	+
		International facilities	N			~	~	~

Economy, society and skills – Contribute to sustainable local economies and social well-being by enhancing the populations' skill base and contributing to employment opportunities, recognising workforce needs, thus supporting vibrant local economies.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Incineration of LLW to recover energy or reduce volume	There are several existing incinerators which are used for the management of LLW from nuclear sites, but the Strategy may increase or decrease demand for this waste route. Incineration facilities provide a small number of employment opportunities including skill development opportunities and few specialists. Consequently utilisation of this approach resulting in expansion of existing facilities would not have a significant effect on local employment figures. Incinerators are often a cause for concern for local communities and are perceived to negatively affect the attractiveness of the local area. However the potential degree of significance of impact would vary depending on the location of any new facility.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			?	?	?
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			0	0	0
Treatment or volume reduction of metallic waste by melting	Melting is an existing practice, although carried out overseas as there are no melting facilities in the UK at present. Should new facilities be developed, construction jobs of all skill levels would be created in the short term and operational roles would be generated in the medium to long term. The effects of this would require consideration at a local level once the location of the facilities was known.	Single national facility near Sellafield	Y	Option is available now	Y	?	?	?
		Single national facility not near Sellafield	Y			?	?	?
		Small number of regional facilities	Y			?	?	?
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			?	?	?

Economy, society and skills – Contribute to sustainable local economies and social well-being by enhancing the populations' skill base and contributing to employment opportunities, recognising workforce needs, thus supporting vibrant local economies.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Volume reduction by compaction	Volume reduction is an existing practice, through low-force compaction at some nuclear industry sites and a small number of regional sites providing high-force compaction. Compaction employment occurs at larger sites in addition to other waste management options. The small number of jobs and skill development opportunities such as trade apprenticeships mean the effect on the local economy would not be significant. At existing sites, the owners and operators of volume reduction facilities have community investment programmes in place to mitigate against negative self-image and community concerns.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			0	0	0
		Multiple local facilities	Y	New facilities required	N	0	0	0
		International facilities	N			~	~	~
Disposal at the LLW Repository	Continuation of existing practices of disposal of waste at the LLW Repository represents no change from the situation before the first implementation of the Strategy therefore it is unlikely to affect the number or types of jobs available at the facility. In the very long term, during the repository's closure phase, employment needs will diminish considerably. LLWR Ltd in West Cumbria has already established a fund to support projects in the local community alongside fundraising and volunteering events. Therefore the strategy will not have a significant effect on investment in the community or economic and social infrastructure.	Single national facility near Sellafield	Y	Option is available now	Y	0	0	0
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~

Economy, society and skills – Contribute to sustainable local economies and social well-being by enhancing the populations' skill base and contributing to employment opportunities, recognising workforce needs, thus supporting vibrant local economies.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal of LLW at landfill sites	Given the relatively low volumes of LLW diverted compared to the total UK waste arisings disposed at landfill it is unlikely that additional employment at landfill sites will be required. Landfill sites generally employ a relatively small number of employees and even expansion of existing facilities is unlikely to have a significant impact on the local economy.	Single national facility near Sellafield	N	Option is available now		~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			+	+	+
		Multiple local facilities	Y	New facilities required		+	+	+
		International facilities	N			~	~	~
Disposal of LLW at non-engineered surface facilities	The in-situ disposal of LLW at nuclear sites would not generate a significant number of jobs, particularly as it is likely that specialist contractors are brought from outside the locality. This may generate some extra pressure on community services, but it is not deemed significant due to the small number of contractors. However, this would be considered at project level once more details are known.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	?	?	?
		International facilities	N			~	~	~

Economy, society and skills – Contribute to sustainable local economies and social well-being by enhancing the populations' skill base and contributing to employment opportunities, recognising workforce needs, thus supporting vibrant local economies.								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Deep disposal of long-lived LLW in a Geological Disposal Facility (GDF)	The construction of a GDF would create a number of employment opportunities at a range of skill levels. If this were to be constructed near Sellafield, the high number of nuclear industry employees and specialists could be utilised meaning that community services would not be subject to significant additional pressure in the short term. However, a GDF would be constructed and operated primarily for the disposal of higher activity wastes; it is unlikely that disposal of LLW there in addition would add to employment or skills development at a GDF either during construction or operation. The environmental assessment of a GDF is ongoing outside of this SEA. It has been determined at a generic level and further assessment would be required when the potential location of the facility is identified.	Single national facility near Sellafield	Y	Option is available now	N	0	0	0
		Single national facility not near Sellafield	Y			0	0	0
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	Y	~	~	~
		International facilities	N			~	~	~

Appendix E Table 10: Traffic and transport

Traffic and transport – Minimise the detrimental effects of traffic and transport on the environment								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Decay storage prior to further treatment or disposal	In general, decay storage would be carried out on the sites where the waste arises. In consequence, there are no traffic and transportation implications associated with this option.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			~	~	~
		Multiple local facilities	Y	New facilities required	Y	~	~	~
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	Decontamination may be carried out on site at each nuclear industry facility, or at dedicated decontamination facilities provided through the supply chain (e.g. the Studsvik metal recycling facility). Therefore, only a proportion of decontamination of LLW requires transport off site. Similarly, transport of LLW as a whole is only a small proportion of freight traffic associated with each nuclear industry site, and this option is unlikely to significantly increase the volume of freight traffic. The number of freight miles to transport of LLW for decontamination depends on the location of each facility. However, the carbon footprint of radioactive waste transport is negligible compared to the UK's overall freight transport footprint, while it is outweighed by the role of the nuclear industry as the UK's largest provider of low carbon energy. Freight from all but three of the UK's nuclear industry sites (Berkeley, Hinkley Point and the LLW Repository) can access the strategic road network without passing through local communities, and this limits the potential for community disruption/disturbance due to transport. The safe transport of LLW is a significant concern of stakeholders, and there is the potential for social amplification of the risks above those suggested by an objective assessment. LLW is transported under strict regulatory rules. The safety record of radioactive waste transport and the low activity level of LLW compared to other wastes suggests the actual safety risk of such transports is unlikely to be significant.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~

Traffic and transport – Minimise the detrimental effects of traffic and transport on the environment								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Reuse LLW to avoid consigning it as waste	The largest bulk reuse activities are likely to comprise the reuse of slightly contaminated soils and rubble for landscaping/void filling on the site from which the waste arises. Any transport requirements would be limited to within the site and would be unlikely to give rise to any significant impact. A proportion of some other forms of low-activity LLW may be transported beyond the site of origin for reuse. However, transport of LLW as a whole is only a small proportion of freight traffic arising at each nuclear industry site, and transport of LLW specifically for reuse would be a much smaller proportion. This option is therefore unlikely to significantly increase the volume of freight traffic. Comments made above (see 'decontamination') re freight miles/ carbon footprint, community disruption and road safety/perceived risk are equally applicable to this option.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~
Recycle LLW after consignment as waste	Most recycling activity is likely to take place after decontamination (dealt with as a separate option). Recycling may take place either on-site or off-site at facilities provided through the supply chain or elsewhere, following the sale of materials on the open market. The majority of recycled materials are likely to be transported off-site. However, transport of LLW as a whole is only a small proportion of freight traffic arising at each nuclear industry site, and transport of specifically of recycled LLW materials would be a still smaller proportion. This option is therefore unlikely to significantly increase the volume of freight traffic. Comments made above (see 'decontamination') re freight miles/ carbon footprint, community disruption and road safety/perceived risk are equally applicable to this option.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~

Traffic and transport – Minimise the detrimental effects of traffic and transport on the environment								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Incineration of LLW to recover energy or reduce volume	There is no incineration capacity at existing nuclear industry sites; however, there are three incinerators provided through the supply chain that are licenced to receive LLW. All LLW destined for incineration is therefore transported to one of the incinerators (2766 cubic metres between February 2013 and March 2014, or around 212 cubic metres a month). This transport requirement was spread over a year, originating from multiple widely-separated sites and travelling to three separate sites. Overall LLW transport forms only a small proportion of freight traffic at each nuclear industry site, and transport of LLW for incineration is a smaller proportion still. Similarly, at each incinerator LLW forms only a small proportion of the freight traffic arriving. This option is therefore unlikely to significantly increase freight traffic, even if incinerator capacity is expanded. Any expansion of incinerator capacity would result in a short-term increase in freight traffic during construction at the new site. During operation, the comments made above would remain valid. Comments made above (see 'decontamination') re freight miles/ carbon footprint, community disruption and road safety/perceived risk are equally applicable to this option.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			-	**0**	**0**
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~

Traffic and transport – Minimise the detrimental effects of traffic and transport on the environment								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Treatment or volume reduction of metallic LLW by melting	Melting of metallic LLW is currently carried out overseas. Any expansion of melting capacity through provision of new facilities in the UK (there is no such proposal at present) would entail a short-term increase in freight traffic during construction. During operation of any new melting facility, comments made above re the quantities of freight transport for LLW (see 'decontamination' etc.) would be equally valid for this option. Comments made above (see 'decontamination') re freight miles/ carbon footprint, community disruption and road safety/perceived risk are equally applicable to this option.	Single national facility near Sellafield	Y	Option is available now	Y	-	0	0
		Single national facility not near Sellafield	Y			-	0	0
		Small number of regional facilities	Y			-	0	0
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			0	0	0
Volume reduction by compaction	Compaction is a well-established practice in the UK. Low-force compaction is carried out at some nuclear industry sites prior to transport of waste for disposal, and high-force compaction at two specific sites (Sellafield and Winfrith). Any potential expansion of low-force compaction capacity to additional nuclear industry sites would reduce the volume of waste before transport and therefore reduce the number of transport movements. However, the change is unlikely to be significant.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			+	+	+
		Multiple local facilities	Y	New facilities required	N	+	+	+
		International facilities	N			~	~	~

Traffic and transport – Minimise the detrimental effects of traffic and transport on the environment								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal at the LLW Repository	In the period February 2013 to March 2014, 202 LLW containers were delivered, predominantly by rail. Access to the LLW Repository by road is through the community of Drigg. The community has benefited in recent years from a decline in freight traffic as a result of the diversion of LLW from disposal during the first five years of implementation of the Strategy. Continued use of the LLW Repository as at present would represent no change. Any change in packaging methods that improved packaging efficiency, and/or any proportional increase in the use of rail freight, could reduce the number of transports through Drigg. Any reversal of the trend for reduced use of the LLW Repository could affect traffic movements in and around Drigg. However, this effect is likely to be small as most deliveries of waste would continue to be by rail. Such a reversal of the trend is not envisaged and would be contrary to the intention of the Strategy.	Single national facility near Sellafield	Y	Option is available now	Y	**?**	**?**	**0**
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N	New facilities required	N	~	~	~
		Multiple local facilities	N			~	~	~
		International facilities	N			~	~	~
Disposal of LLW at landfill sites	A total of 6242 cubic metres of LLW was transported to landfill sites between February 2013 and March 2014 (around 480 cubic metres a month, divided between three landfill sites). This transport requirement was spread over a year, originating from multiple widely-separated sites and travelling to three separate sites. Overall LLW transport forms only a small proportion of freight traffic at each nuclear industry site, and transport of LLW to landfill is a smaller proportion still. Similarly, at each landfill LLW forms only a small proportion of the freight traffic arriving. This option is therefore unlikely to significantly increase freight traffic, even if incinerator capacity is expanded. Licensing of any additional landfill sites to receive LLW would not significantly change this assessment. Comments made above (see 'decontamination') re freight miles/ carbon footprint, community disruption and road safety/perceived risk are equally applicable to this option.	Single national facility near Sellafield	N	Option is available now		~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y	New facilities required		**0**	**0**	**0**
		Multiple local facilities	Y			**0**	**0**	**0**
		International facilities	N			~	~	~

Traffic and transport – Minimise the detrimental effects of traffic and transport on the environment								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal of LLW at non-engineered surface facilities	Disposal of LLW in dedicated landfill-style facilities could use existing voids, newly excavated voids or land-raising techniques, located within nuclear industry sites, adjacent to them or elsewhere. This means that use of such techniques could, for a proportion of waste disposed by this method, require transport off site. However, LLW transport forms only a small proportion of freight transport at each nuclear industry site, and it is likely that transport of LLW to such non-engineered facilities would comprise only a very small proportion of LLW transport. It is therefore very unlikely to significantly increase freight traffic as a whole. On-site disposal with appropriate containment is unlikely to require significant transport other than within the site during preparation works. Comments made above (see 'decontamination') re freight miles/ carbon footprint, community disruption and road safety/perceived risk are equally applicable to this option.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~
Deep disposal of long-lived LLW in a Geological Disposal Facility (GDF)	Transport of any LLW to a GDF could, in principle, be achieved using either road freight or rail freight or a mixture of the two. It is intended that a railhead will be provided at a GDF; the practicability of rail freight depends on the ability to despatch LLW by rail from the source. Nine nuclear industry sites in England and Wales have or are in close proximity to a railhead (Scottish policy precludes use of a GDF). Only those LLW wastes that contain problematic radionuclides or other contaminants that preclude disposal at the LLW Repository or that render other management routes impracticable would be designated for disposal at a GDF. The overall quantity of such LLW is not known, but it is not anticipated to be large, and it would be derived from multiple sources. Comments made above (see 'decontamination') re freight miles/ carbon footprint, community disruption and road safety/perceived risk are equally applicable to this option. This option is not relevant in the short term, as a GDF will not be available on that timescale.	Single national facility near Sellafield	Y	Option is available now	N	~	0	0
		Single national facility not near Sellafield	Y			~	**0**	**0**
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	Y	~	~	~
		International facilities	N			~	~	~

Appendix E Table 11: Land use

Land use – Contribute to the sustainable use of land within environmental limits									
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Decay storage prior to further treatment or disposal	It is unlikely that there would be any new land take related to the construction of storage facilities. Decay storage is most likely to be applied to relatively small quantities of waste, potentially making use of existing storage facilities rather than purpose-built facilities, on existing nuclear industry sites. There would not be any release of land in the short or medium term but it may be possible in the long term depending on the final waste management route. As all radionuclides and other contaminants will be contained in a surface facility, it is not envisaged that there would be any relationship with local water resources, soil function and quality which might impact on any surrounding land uses.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**?**
		Multiple local facilities	Y	New facilities required	Y	**0**	**0**	**?**
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	If required, construction and operation of any new decontamination plant for metallic or other LLW (whether at a nuclear industry site or a waste management site) could result in land-take. Certain decommissioning activities could in principle raise the risk of contamination of soils, groundwater and surface water bodies (if present in close proximity), particularly where chemical decontamination techniques are applied, as a result of accidental spillages. This contamination could have negative impacts for surrounding land uses such as agriculture. However, all such activities are carried out in accordance with strict legal requirements, including the detailed provisions of relevant permits, which specify required preventative measures and containment measures. The strict application and enforcement of these measures means that, in practice, no significant impact is likely.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~

Land use – Contribute to the sustainable use of land within environmental limits									
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Reuse LLW to avoid consigning it as waste	Reuse would involve disassembly at existing local facilities for reuse either in new facilities at the same site or at other, new local facilities. Some intermediate storage may be required depending on demand for the material, but it is unlikely that any new facilities would be constructed for this purpose. The reuse of material that remains radioactive would be limited to circumstances that do not create a potential for an increase in exposure to radiation for human populations. However, if material is reused for landscaping on decommissioned nuclear sites it may impact on the site end state's ability to keep within environmental limits and restrict the future potential land uses of the site. There may also be potential for the radionuclides to interact with the natural assets surrounding the sites which could have negative impacts on associated land use e.g. agriculture. Such effects may be open to avoidance or mitigation but could only be identified at a site-specific level at EIA stage. The low level waste used would replace material sourced from elsewhere which would reduce the use of raw materials.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	N	New facilities required	N	~	~	~
		Multiple local facilities	Y			**?**	**?**	**?**
		International facilities	N			~	~	~
Recycle LLW after consignment as waste	If new facilities are required for the melting of metals or recycling of other materials for this option, there may be some land take required. Decontamination may occur at these facilities but this has been dealt with separately. This assessment assumes that the recycled metals will have no increased risk on surrounding land uses than the use of virgin metals. However, recycling metals may reduce demand for virgin metals and the associated environmental impacts of mining natural resources required.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y	New facilities required	N	**0**	**0**	**0**
		Multiple local facilities	Y			**0**	**0**	**0**
		International facilities	N			~	~	~

Land use – Contribute to the sustainable use of land within environmental limits								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Incineration of LLW to recover energy or reduce volume	Incinerators at existing nuclear industry sites have closed due to new legal requirements on air quality. There is potential for these facilities to be reused or the land released. However, in addition to international facilities, the supply chain has provided new incinerator capacity elsewhere for the disposal of LLW / reduction of volume of LLW. If further facilities are required, changing the permit of an existing commercial incinerator so that it can accept low level waste would not cause any land take. New purpose-built facilities would require land-take either on or separate to existing nuclear sites. This approach may have negative impacts on adjacent land uses through the settling out of pollutant emissions to air. The precise effects are uncertain without detailed knowledge of the thermal processes to be applied and the wastes to be treated. The use of incinerators will not impact on site end states and therefore the effect on future site land use is negligible.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			?	?	?
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~
Treatment or volume reduction of metallic LLW by melting	The UK has no facilities for melting metal wastes, but there is the potential to create such facilities, while overseas facilities are in use. New facilities would require land take, either adjacent or separate to nuclear sites. There are several facilities in the UK where compaction is carried out. Thermal processes such as melting can result in the emission to air of radionuclides, volatile organic compounds, other pollutants and particulate matter. Any consequent release of such pollutants could affect local land uses. However, any such thermal treatment processes are strictly governed by conditions under Environmental Permits as outlined under the previous option and this is likely to prevent any significant impact on the environment.	Single national facility near Sellafield	Y	Option is available now	Y	?	?	?
		Single national facility not near Sellafield	Y			?	?	?
		Small number of regional facilities	Y			?	?	?
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			?	?	?

Land use – Contribute to the sustainable use of land within environmental limits								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Volume reduction by compaction	Low force compaction is a relatively low-technology activity that can be carried out in existing buildings on existing nuclear industry sites. High force compaction does require dedicated facilities and is carried out on a two existing nuclear industry facilities that provide a service for the industry as a whole, plus Dounreay which will compact its own waste. In neither case are there any specific considerations that would place restrictions on future land use or site end states beyond any that already exist for other reasons.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~
Disposal at the LLW Repository	The LLWR has recently constructed Vault 9 to increase capacity for LLW and current plans show a requirement for six more vaults. These would be constructed within the site boundary and not require land take outside of the site. It is considered unlikely that continued use of the LLW Repository within these parameters would significantly affect the use of adjacent land.	Single national facility near Sellafield	Y	Option is available now	Y	**0**	**0**	**0**
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~

Land use – Contribute to the sustainable use of land within environmental limits								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal of LLW at landfill sites	If further landfill facilities are required, changing the permit of an existing landfill so that it can accept low level waste would not cause any land take. Purpose built facilities would require land-take either on or separate to existing nuclear sites. In principle, there is the potential for surrounding land uses to be affected by leachate from LLW disposed at landfill sites. However, it is a requirement, in the context of permitting regulations, that prior to acceptance of any LLW at such a facility for disposal, it can be demonstrated that no detrimental long-term effect would occur. This is likely to limit the type of LLW that can be disposed of at such sites to the lowest-activity categories of LLW (and this is the case at the three existing landfill sites licenced to receive LLW). In consequence, no significant impact is expected.	Single national facility near Sellafield	N	Option is available now		~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required		**0**	**0**	**0**
		International facilities	N			~	~	~
Disposal of LLW at non-engineered surface facilities	The construction of dedicated new non-engineered facilities using landfill or novel methods for the disposal of LLW would require land take either on or separate to nuclear sites. In-situ disposal of contaminated soils would not increase the amount of land required to support operations, however it may significantly restrict release of land for beneficial reuse as well as the potential future land-use of the sites. There remains the potential for ground and surface water bodies to be indirectly affected as a result of leachate from LLW entering groundwater, which may have consequences for the surrounding land uses. However, in some cases, particularly where the material used is VLLW, the material may decay within the timescales quoted to a level where it is no longer classified as radioactive waste. The actual occurrence of impacts can only be confirmed and assessed through the site-selection and EIA process.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	**?**	**?**	**?**
		International facilities	N			~	~	~
Deep disposal of	The construction of a GDF would require long-term or permanent land	Single national facility near Sellafield	Y	Option is	N	**0**	**0**	**0**

Land use – Contribute to the sustainable use of land within environmental limits								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
long-lived LLW in a Geological Disposal Facility (GDF)	take for the site and associated transport links. Depending on the location of the site it could lead to: loss of recreational or community land; loss or severance of agricultural land or loss of access and disruption of agricultural practices; and loss of agricultural soils and interruption of existing drainage or water-supply systems. However, none of these effects are attributable to the disposal of LLW at a GDF, as a GDF would be constructed principally for the disposal of higher activity waste and disposal of LLW would be a secondary use of the facility, using only a small part of its capacity. It is not practicable to make a meaningful assessment of these construction, operational and closure effects without knowledge of the site of a GDF, or at least of the community in which it would be located. However, the effects could be minimised through consideration in site selection and site specific design.	Single national facility not near Sellafield	Y	available now		**0**	**0**	**0**
		Small number of regional facilities	N	New facilities required	Y	~	~	~
		Multiple local facilities	N			~	~	~
		International facilities	N			~	~	~

Appendix E Table 12: Noise and vibration

Noise and vibration – Minimise disturbance to people and wildlife from noise and vibration									
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Decay storage prior to further treatment or disposal	Packaging waste for decay storage should have no more noise implications than packaging for any other form of management, and is therefore considered neutral. Once packaged and placed in storage, decay storage is essentially a silent and passive process. No potential noise and vibration impacts are therefore anticipated.	Single national facility near Sellafield	N	Option is available now	N	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	Y	**0**	**0**	**0**
		International facilities	N			~	~	~
Decontamination of facilities, materials and equipment before consignment as waste	There are a wide range of techniques involved in decontamination, including physical processes such as shot-blasting, concrete scabbling, high-pressure water sprays etc. and chemical processes. In general, the physical processes have a higher potential to generate noise than the chemical processes, although there is a great degree of variation within the physical process category. The potential to create noise impact depends on a number of factors, including: the level and frequency of the noise itself; the proximity of any receptor (human or nature conservation); and the presence and effectiveness of any barriers to noise between the source and the receptor. So, a significant noise source may create no significant impact if it is either effectively shielded (e.g. within a building) or sufficiently distant from the nearest receptor or both. In this context, it is not possible to assess the effects of noise at a strategic level as it requires site-specific information not likely to be available until the stage of site selection or Environmental Impact Assessment.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	Y	New facilities required	N	**?**	**?**	**?**
		International facilities	N			~	~	~

Noise and vibration – Minimise disturbance to people and wildlife from noise and vibration								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Reuse LLW to avoid consigning it as waste	Any noise associated with the dismantling of equipment or plant prior to reuse is likely to be negligible. No other significant noise or vibration is expected in association with this form of reuse. Reuse of slightly contaminated soils or rubble in void filling or landscaping on existing sites implies an element of earth moving on site. However, unless such works are particularly large-scale (which is unlikely) and are located adjacent to the site boundary close to receptors, this is most likely to be implemented through individual items of plant operating in a dispersed manner around a large site. This form of works is most unlikely to cause significant noise or vibration impacts. Such works would only be a short-term issue. Once in place, such reuse would be essentially silent.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility elsewhere	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~
Recycle LLW after consignment as waste	Similarly to decontamination, recycling can involve a number of techniques, some of which can generate significant levels of noise (especially recycling of metals). The level of noise will vary significantly with the type of material and the technique in use. The potential to create noise impact depends on a number of factors, including: the level and frequency of the noise itself; the proximity of any receptor (human or nature conservation); and the presence and effectiveness of any barriers to noise between the source and the receptor. So, a significant noise source may create no significant impact if it is either effectively shielded (e.g. within a building) or sufficiently distant from the nearest receptor or both. In this context, it is not possible to assess the effects of noise at a strategic level as it requires site-specific information not likely to be available until the stage of site selection or Environmental Impact Assessment.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	Y	New facilities required	N	**?**	**?**	**?**
		International facilities	N			~	~	~

Noise and vibration – Minimise disturbance to people and wildlife from noise and vibration								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Incineration of LLW to recover energy or reduce volume	Incineration processes and supporting activities can generate noise. However, all incinerators operate to strict noise limits agreed with and regulated by the local authority. The potential to create noise impact depends on a number of factors, including: the level and frequency of the noise itself; the proximity of any receptor (human or nature conservation); and the presence and effectiveness of any barriers to noise between the source and the receptor. So, a significant noise source may create no significant impact if it is either effectively shielded (e.g. within a building) or sufficiently distant from the nearest receptor or both. In this context, it is not possible to assess the effects of noise at a strategic level as it requires site-specific information not likely to be available until the stage of site selection or Environmental Impact Assessment.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~
Treatment or volume reduction of metallic LLW by melting	Melting is current undertaken overseas. Any proposal to extend capacity through the provision of new plant in the UK would entail the construction and operation of new industrial-scale infrastructure with the potential to generate significant noise. The potential noise impacts of such a development (there is no such proposal at present) can only be assessed on a site-specific basis.	Single national facility near Sellafield	Y	Option is available now	Y	**?**	**?**	**?**
		Single national facility not near Sellafield	Y			**?**	**?**	**?**
		Small number of regional facilities	Y			**?**	**?**	**?**
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	Y			**?**	**?**	**?**

Noise and vibration – Minimise disturbance to people and wildlife from noise and vibration								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Volume reduction by compaction	Compaction is a well-established practice in the UK. It does have the potential to create some noise, but as low-force compaction does not require substantial infrastructure its location within any nuclear industry site can be sensitively chosen to limit the potential to affect receptors. In addition, it would normally be carried out within existing buildings which would screen all or most of the noise from any distance. High force compaction requires dedicated infrastructure that can be designed to screen out noise and that would require planning consent for any new facilities, which would be subject to noise-related conditions. It is not therefore anticipated that any significant impact would occur.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			**0**	**0**	**0**
		Multiple local facilities	Y	New facilities required	N	**0**	**0**	**0**
		International facilities	N			~	~	~
Disposal at the LLW Repository	There is some noise generated from existing packaging practices prior to dispatch to the LLW Repository, through the grouting process. Continued application of this process would represent 'no change'. It is unclear what implications for noise there would be if packaging practices were to change. However, it is considered unlikely that it would be significantly greater than current practices, and as all or most packaging is done inside existing buildings, which screen the noise from any distance, then no significant impact is anticipated. Continued disposal of the waste at the LLW Repository in effect represents 'no change' from existing and historic practice and does not imply any significant impact.	Single national facility near Sellafield	Y	Option is available now	Y	**0**	**0**	**0**
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	N	New facilities required	N	~	~	~
		International facilities	N			~	~	~

Noise and vibration – Minimise disturbance to people and wildlife from noise and vibration								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Disposal of LLW at landfill sites	Disposal of LLW at landfill sites could add to the noise generated at each landfill site due to an increase in the overall level of activity at the site. The occurrence of such impacts can only be confirmed and their severity assessed through site-specific assessment.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	Y			?	?	?
		Multiple local facilities	Y	New facilities required	N	?	?	?
		International facilities	N					
Disposal of LLW at non-engineered surface facilities	Disposal of LLW in dedicated landfill-style facilities could use existing voids, newly excavated voids or land-raising techniques, located within nuclear industry sites, adjacent to them or elsewhere. Each of these techniques has different potential implications for the creation of noise and vibration and different degrees of potential impact on receptors in the short to medium-term, during construction of the site and placement of the waste. Until the specific method to be applied in each case is known, the assessment remains uncertain. In the long term, once the waste is placed, there would be no impact. Disposal in situ entails leaving the waste in place, which is in itself a silent process. However, it remains uncertain what scope of works would be required to achieve 'appropriate containment' and this is likely to vary from site to site, and have different implications for noise and vibration. Accordingly, this assessment can only be made at a site-specific level.	Single national facility near Sellafield	N	Option is available now	Y	~	~	~
		Single national facility not near Sellafield	N			~	~	~
		Small number of regional facilities	N			~	~	~
		Multiple local facilities	Y	New facilities required	N	?	?	?
		International facilities	N			~	~	~

Noise and vibration – Minimise disturbance to people and wildlife from noise and vibration								
How will the waste be managed?	**Description of the impact**	**Where will the waste be managed?** (options open for this management route)		**When will the waste management route be available?**		**Impact**		
						Short term	**Medium term**	**Long term**
Deep disposal of long-lived LLW in a Geological Disposal Facility (GDF)	Disposal of LLW at depth in a GDF is very unlikely to add significantly to any noise already being generated by the operation of a GDF. It is not considered likely that any significant additional impact would occur.	Single national facility near Sellafield	Y	Option is available now	N	~	**0**	**0**
		Single national facility not near Sellafield	Y			**~**	**0**	**0**
		Small number of regional facilities	N			**~**	**~**	**~**
		Multiple local facilities	N	New facilities required	Y	**~**	**~**	**~**
		International facilities	N			**~**	**~**	**~**

Appendix F – Changes in SEA approach from 2009 to 2014

Introduction

The approach to SEA adopted in this report has been developed from that used in the SEA of 2009-10, as described in the 2009 Environment and Sustainability Report. The approach is not identical; certain changes have been made, taking into account:

- Developments in SEA practice and experience since 2009;
- Adjustments to take account of changes in the first five years of implementation of the Strategy;
- A thorough review and reconsideration of the original Environment and Sustainability Report;
- Discussions with statutory environmental bodies and other stakeholders.

Key changes that have been made and the rationale behind them are as follows:

Strategic options

The 2009 Environment and Sustainability Report set out a detailed list of strategic options for implementation of the Strategy. No such list actually appears in the Strategy itself; the list is based on interpretation and extrapolation from the text of the Strategy.

In considering the list of strategic options for inclusion in this report, we have used the original list as a starting point, but have made adjustments to it, to take account of:

- Changes arising from the first five years of implementation of the Strategy;
- A reconsideration of the original list in the light of the original Strategy, seeking to avoid the inclusion of options that are too similar to each other;
- Proposed changes arising to the Strategy itself as a result of the current review.

Environmental and sustainability objectives and guide questions

At the core of the assessment is a suite of 'environmental and sustainability objectives', each of which has associated with it a set of guide questions to assist in making the assessment.

The 2009 assessment used a total of 15 objectives, which we have reduced to 11 for the purposes of this assessment. The full list of the 2014 objectives, with their definitions, is given in Chapter 3 of the main text (Table 3.1), and the guide questions in Chapter 3 (Table 3.4).

Reducing the number of objectives does not mean that we are reducing the environmental scope of the assessment, merely that we are dividing it up differently, and in some cases that we are eliminating non-environmental content. The objectives deleted are described in the table overleaf, with an accompanying rationale.

Appendix F Table 1 Deleted environment and sustainability objectives

Objective	Definition of objective	Relevant SEA Directive themes	Guide questions	Rationale for removal
Waste	Provide optimised waste solutions and apply the waste hierarchy to minimise the quantity of waste going to disposal and the detrimental impacts of waste management on the environment and local communities.	Material assets	Will the Strategy promote the application of the waste hierarchy and have an effect on waste management? Will the Strategy affect the safety or environmental impact of radioactive waste storage? Will the Strategy affect the quantity of radioactive or other waste sent for disposal?	The objective as defined duplicates the intention of the Strategy itself, while the guide questions duplicate the overall intention of the SEA itself in miniature. The whole SEA addresses this issue, which is central to every objective addressed in this report, therefore it is redundant to address it separately as an objective in its own right.
Health and Safety	Ensure the continued protection of people's safety and health.	Human health	Will the Strategy cause a change in the types of activities that have the potential to change health or safety risks to workers? Will the Strategy result in a change in activities which may affect the health and safety risks of non-workers (such as nearby residents)? Will the Strategy have an indirect effect on health and safety of the population (e.g. by affecting food production or changes in dosage levels). Will the Strategy result in a change in the radiation dose to workers? Will the Strategy result in a change in the radiation dose to critical groups in local communities? Will the Strategy affect behaviour?	'Human health' as an SEA topic is addressed under a number of other objectives (e.g. air quality, noise and vibration, surface water quality and resources, etc.). The issues relevant to SEA are addressed there and it would be inappropriate to duplicate. Health and safety specific issues are unlikely to be effectively addressed in an SEA – they are 'tactical' rather than 'strategic' – and are much better addressed in other forms of assessment at site-selection or later stages. In addition, they are not environmental questions.
Hazard reduction	Reduce the hazard potential posed by radioactive materials, and minimising the environmental risk as soon as possible.	Human health	Will the Strategy cause a change in the potential hazard posed by radioactive wastes and materials through conditioning, or by other appropriate means, into safer forms? Will the Strategy have an effect on the time taken to reduce the potential hazard posed by radioactive wastes or materials? Will the Strategy cause a change in the risk of any accidental release whether from storage, treatment or ordinary operation?	Again, the relevant human health issues are dealt with under other headings (air quality etc.) and it is considered inappropriate to duplicate. Hazard reduction is considered a technical topic best suited to other forms of assessment at later, site-specific stages.
Value for money and affordability	To achieve the NDA's mission in a manner which maximises the value for money for taxpayers by considering the lifecycle cost, and the taxpayers contribution to NDA funding within each spending review period.	None	None	This is a UK strategy, not an NDA strategy. In addition, while this is an important issue it is not an environmental one and has no relationship with the SEA Directive.

Detailed assessment matrix (Appendix E)

The detailed assessment matrices provided in Appendix E have been redesigned and restructured to improve clarity and navigability and to reduce the amount of unnecessary repetition.

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