

Managing Radioactive Waste Safely: Desk-based Identification and Assessment of Potential Candidate Sites for Geological Disposal

A Public Consultation

© Crown copyright 2011

Copyright in the typographical arrangement and design rests with the Crown.
This publication (excluding logos) may be re-used free of charge in any format or medium
provided that it is re-used accurately and not used in a misleading context. The material must be
acknowledged as crown copyright and the title of the publication specified.

Contents

1.	General information	5
2.	Executive Summary	7
3.	Introduction and background.....	10
4.	Desk-based Studies: MRWS Stage 4	14
5.	Identifying Potential Candidate Sites	17
6.	Assessing Potential Candidate Sites.....	26
7.	Decision making.....	36
	Annex A - Summary of Questions	37
	Annex B - Glossary.....	38

1. General information

Purpose of this consultation

- 1.1 The consultation sets out proposals for desk-based identification and assessment of Potential Candidate Sites for geological disposal of higher activity radioactive waste under the Managing Radioactive Waste Safely programme.

Territorial extent:

- 1.2 The Managing Radioactive Waste Safely White Paper was published by UK Government and the devolved administrations for Wales and Northern Ireland. Currently this is a consultation by UK Government only as the areas that have 'Expressed an interest' in the process so far have been in England. For the purpose of this consultation the term "Government" refers to the UK Government unless the context indicates otherwise.

Responding to this consultation

- 1.3 When responding please state whether you are replying as an individual, or on behalf of an organisation. If you are responding on behalf of an organisation, please make it clear who the organisation represents and, where applicable, how you assembled the views of members.

- 1.4 Responses should be submitted to:

Managing Radioactive Waste Safely Team
Department of Energy and Climate Change
Area 3 D
3 Whitehall Place
London
SW1A 2AW
Email: radioactivewaste@decc.gsi.gov.uk

- 1.5 This consultation runs from 28th June 2011. **Closing date for responses is September 30th 2011.**

Additional copies

- 1.6 You may make copies of this document without seeking permission. An electronic version can be downloaded from DECC's website (www.decc.gov.uk/consultations/) and further printed copies can be requested from the above address.

Confidentiality & Data Protection

- 1.7 Information provided in response to this consultation, including personal information, may be subject to publication or release to other parties or to disclosure in accordance with the access to information regimes (these are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 (DPA) and the Environmental Information Regulations 2004).
- 1.8 If you want information that you provide to be treated as confidential please say so clearly in writing when you send your response to the consultation. It would be

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

- 1.9 We will summarise all responses and place this summary on our website at www.decc.gov.uk/en/content/cms/consultations/. This summary will include a list of organisations that responded but not the names, addresses or other contact details of individuals who respond.

Help with queries

- 1.10 Please direct any queries about the consultation to our consultation mailbox radioactivewaste@decc.gsi.gov.uk or in writing to the address given above.
- 1.11 This consultation has been carried out in accordance with the Government's Code of Practice on consultation, which can be found at <http://www.bis.gov.uk/files/file47158.pdf>.
- 1.12 If you have any complaints about the consultation process (as opposed to comments about the issues which are the subject of the consultation) please address them to:

DECC Consultation Co-ordinator
3 Whitehall Place
London SW1A 2AW
Email: consultation.coordinator@decc.gsi.gov.uk

2. Executive Summary

- 2.1 Published in June 2008, the White Paper Managing Radioactive Waste Safely: A Framework for Implementing Geological Disposal¹ set out Government's staged approach to implementing the geological disposal of higher activity radioactive waste.
- 2.2 The staged siting process for a geological disposal facility begins with communities voluntarily 'expressing an interest' in the process with regards to a specific area. Subsequently an initial, high level, sub-surface unsuitability test is undertaken, using existing information to rule out those rock volumes in that area which would be clearly unsuitable for a facility. Following local engagement, the local authority responsible for the area that had expressed an interest would then make a decision whether or not to participate in the next stage of the siting process. This consultation sets out proposals for that next stage, Desk-based Studies.
- 2.3 The consultation firstly sets out a framework for how Potential Candidate Sites for a geological disposal facility could be identified from an area which has been put forward following a decision to participate. The framework aims to enable a nationally consistent, high level approach across all areas for which there is a decision to participate. However, to provide local flexibility, Community Siting Partnerships that are set up to bring together the local authority and other local partners, will be able to adapt or develop the process to use local criteria, incorporating local issues, as well as using the criteria published in the MRWS White Paper.
- 2.4 Using these criteria, a high level identification process, likely to use geographic information systems (GIS) to map information in relation to a 'decision to participate' area, would be undertaken to identify potentially suitable surface areas and potentially suitable host rocks. In parallel, Community Siting Partnerships should begin to specifically engage more local representatives of potentially suitable areas which could result in revisions to the local criteria, or their application, and a further narrowing of the range of Potential Candidate Sites.
- 2.5 Safety is an essential requirement throughout the site selection process and before Potential Candidate Sites move into the desk-based assessment process, an initial consideration of the safety implications of implementing a geological disposal facility at specific sites would be undertaken. This would be a high level review and could focus the assessment on those Potential Candidate Sites that show the most potential. A high level consideration of environmental implications and of the potential costs associated with particular sites could also be undertaken at this point.
- 2.6 The consultation then explains how Potential Candidate Sites, once identified, will be assessed. Desk-based site assessment will need to be consistently applied to

¹ White Paper available at <http://mrws.decc.gov.uk/>

any Potential Candidate Site, anywhere across the country and therefore a national process is set out. Using an approach based on multi criteria decision analysis (MCDA), Potential Candidate Sites will be evaluated against set criteria, using set scoring scales. These will then be combined with a weighting process, based on stakeholders' views, to show how the evaluation of sites changes, depending on the relative importance of the criteria. The consultation is clear that the MCDA process does not actually make a decision but is used as a decision aiding tool.

- 2.7 As with the identification of Potential Candidate Sites, the MCDA will use the broad criteria from the MRWS White Paper, which will be further developed, taking into account responses to this consultation, and then published. Once criteria have been published, scoring scales for each of the criteria will be developed at a national level before they are applied to evaluate any Potential Candidate Sites.
- 2.8 The consultation sets out how the weightings for criteria will be established with local partners and stakeholders and then fed into the evaluation. The results would be written up into a Desk-based Assessments Report, which would provide a matrix of overall scores for each Potential Candidate Site showing how differences in the weighting of the criteria affect the evaluation. In particular it will allow stakeholders' views on the importance of the different criteria to be evaluated and their impact on the overall scores of Potential Candidate Sites to be understood. It would outline any strengths or weaknesses of the Potential Candidate Sites, where there may be uncertainties associated with the assessment, and provide a clear audit trail to feed into decision making.
- 2.9 The final part of the consultation sets out how local decisions will be made about whether Potential Candidate Sites could move to the next stage of the process, surface-based investigations. Decision making will need to be undertaken in a structured, evidence based and transparent way and the Desk-based Assessments Report will be a key input to the local decision making process. A local authority/ies, in deciding whether to proceed to the next stage, may also take into account other considerations, for example the extent of local support or whether future stages in the process provide sufficient opportunity for any outstanding issues and concerns to be addressed.
- 2.10 The Government would then decide on an appropriate Candidate Site or selection of Sites to take forward to the next stage, taking into account additional information, for example, the draft findings of the Strategic Environmental Assessment² and any Habitats Regulations Assessment³, or the range of geological settings available from those Potential Candidate Sites put forward by a local authority/ies.

² In this document, Strategic Environmental Assessment refers to the type of environmental assessment legally required by EC Directive 2001/42/EC in the preparation of certain plans and programmes. European Parliament and the Council of the European Union, "Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the Assessment of the Effects of certain Plans and Programmes on the Environment", Official Journal of the European Communities, L197, 2001.

³ A Habitats Regulations Assessment will have to be conducted if the proposed plans could have a potential impact on certain nature conservation areas, known as "European sites" which are designated and protected under the Habitats Directive. European Parliament and Council of the European Union, 'Directive on the conservation of natural habitats and of wild flora and fauna', Official Journal of the European Union, OJ L 206, 22.7.1992, p. 7, May 1992.

- 2.11 Any Potential Candidate Sites which move forward into the next stage, surface-based investigations, will be subject to increasingly detailed assessments, with resources becoming focussed on investigating those that are most likely to be suitable.

3. Introduction and background

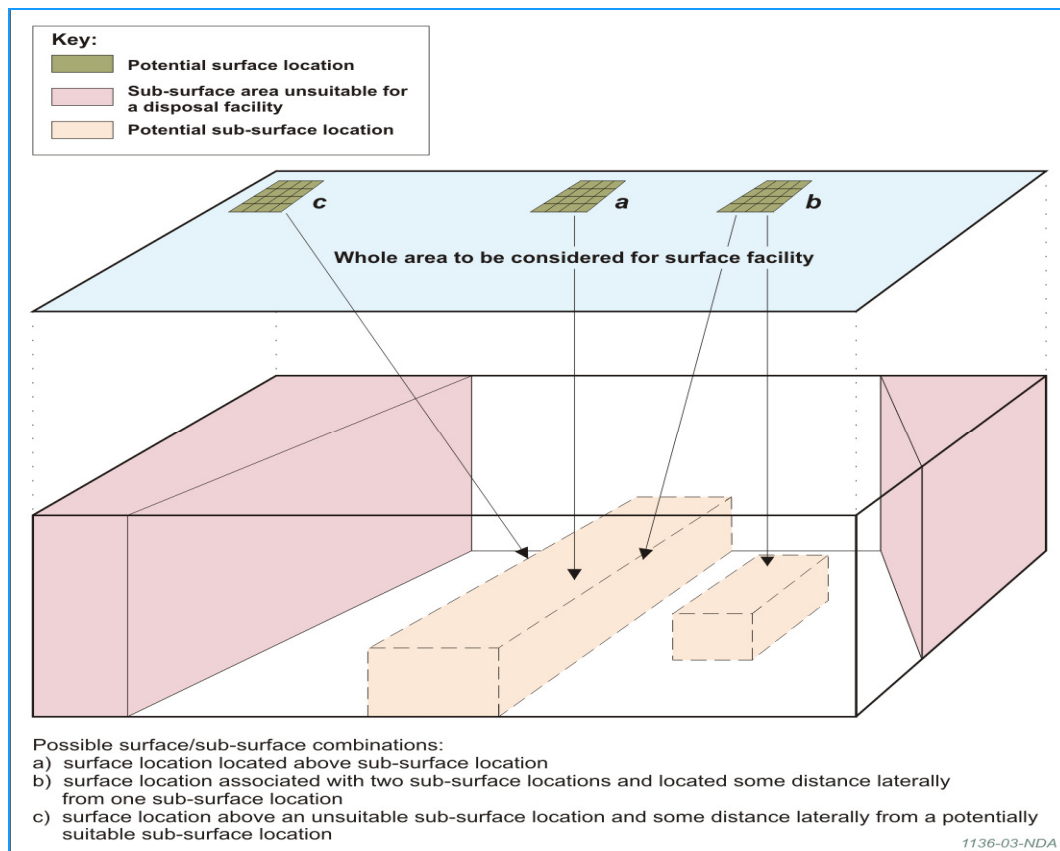
- 3.1 The Managing Radioactive Waste Safely (MRWS) programme⁴ was initiated in 2001 with the aim of finding a practicable solution for the UK's higher activity radioactive waste. Government's response to the subsequent recommendations of the independent Committee on Radioactive Waste Management (CoRWM)⁵ in 2006 and Government's White Paper Managing Radioactive Waste Safely: A Framework for Implementing Geological Disposal in June 2008 set out that geological disposal is the way higher activity radioactive waste will be managed in the long term. The White Paper outlined that the Nuclear Decommissioning Authority⁶ (NDA) would be responsible for implementing geological disposal on behalf of the Government.
- 3.2 Geological disposal involves isolating radioactive waste within engineered, multi-barrier facilities, typically between 200 and 1,000 metres deep, inside a suitable rock formation to provide a barrier against the escape of radioactivity.
- 3.3 A geological disposal facility has two major components:
- the underground facility, comprising access tunnels/shafts, the vaults that would hold the waste, any ventilation shafts etc.; and
 - the surface facility, comprising of buildings to receive and transfer waste underground, workshops, offices, possibly waste packaging facilities etc.
- 3.4 NDA has developed illustrative designs which currently assume that the surface facility is located directly above the underground facility, but recognise that they could be horizontally separated and linked by drifts or inclined tunnels. For now, NDA assume that the horizontal distance between the surface facility and the underground vaults could be up to 10km. This is a planning assumption and site specific considerations may mean that it could be shorter than 10km or perhaps longer.
- 3.5 The range of geological settings that could be suitable for hosting a geological disposal facility for higher activity radioactive wastes is diverse. A volume of rock considered potentially suitable for the underground facility may be accessed from a number of different possible surface locations. Similarly one surface location could access several different volumes of host rock. Some of the potential surface and sub-surface combinations are illustrated schematically in Figure 1.

⁴ Background on the MRWS programme, the MRWS White paper and other key documents can be found at <http://mrws.decc.gov.uk/>

⁵ Background on CoRWM can be found at <http://corwm.decc.gov.uk>

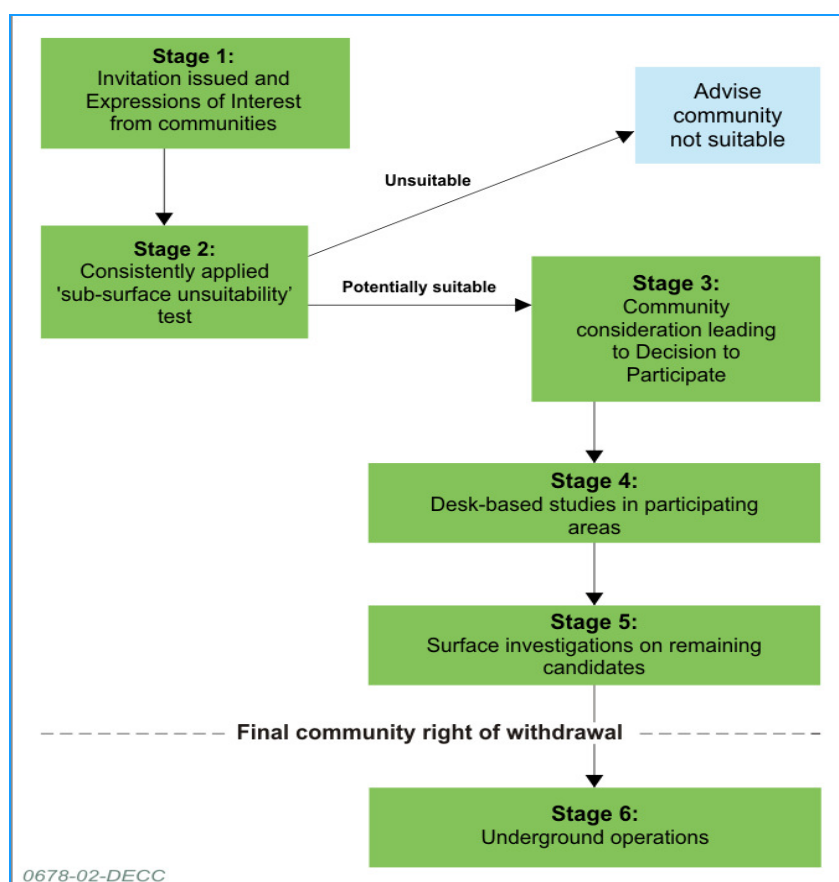
⁶ NDA has established a Radioactive Waste Management Directorate (RWMD) which in due course will become a separate 'delivery organisation' working to the NDA. For ease, this consultation refers to NDA throughout although it is likely to be NDA's 'delivery organisation' which will be delivering the programme during this desk-based assessment stage.

Figure 1 Schematic illustration showing potential surface area and sub-surface rock volume combinations for a geological disposal facility



- 3.6 In principle, Government sees no case for having more than one geological disposal facility, if one facility can be developed to provide suitable, safe containment for the radioactive wastes that need to be managed. This is because the sharing of a surface facility, access tunnels, construction support and security provision could lead to significant benefits, including major cost savings and lower environmental impacts.
- 3.7 Based on the recommendations of CoRWM and successful approaches internationally, the framework for implementing geological disposal is staged and based upon voluntarism and partnership. The figure below shows the staged siting process as set out in the MRWS White Paper.

Figure 2 Stages in the Site Selection Process



- 3.8 The staged siting process set out in the MRWS White paper begins with communities voluntarily 'Expressing an Interest' in the process (Stage 1) and subsequently Decision Making Body/ies⁷ taking further decisions whether or not to progress to each new stage of the process. Right up until a decision whether or not to move into Underground Operations (i.e. at the end of Stage 5), Decision Making Body/ies, based on advice from the local Community Siting Partnership⁸, are able to exercise a Right of Withdrawal from the process.
- 3.9 Following an initial Expression of Interest, a sub-surface unsuitability test (Stage 2) would be carried out by the British Geological Survey (BGS). This would use existing geoscientific data, tested against consistently applied, high level exclusion criteria⁹ to identify those rock volumes in an expression of interest area that would be clearly unsuitable for a geological disposal facility. This would not show where a facility would eventually be located but would avoid communities participating in discussions and deliberations in relation to rock volumes which are obviously geologically unsuitable. It is worth noting however, that locations above rock

⁷ The Local Government decision-making authority/ies for a community.

⁸ Government expects a Community Siting Partnership to be a partnership of local community interests. The NDA's delivery organisation would be a member but would not be directly involved in decisions on community-related issues. Government could participate in the work of the Community Siting Partnership as and when required.

⁹ The criteria upon which this test is based are set out in Annex B of the MRWS White Paper. (<http://mrws.decc.gov.uk/>)

volumes excluded by the BGS screening for the underground facility could still be considered for siting a surface facility (see Figure 1).

- 3.10 Further assessment of any area cannot begin until a Decision Making Body/ies makes a Decision to Participate (Stage 3). For areas which are taken forward to each new stage of the process increasingly detailed assessments, applying more localised geological and other criteria, will need to be undertaken in Stage 4 (Desk-based Studies), Stage 5 (Surface-based Investigations) and Stage 6 (Underground Operations).
- 3.11 This consultation sets out proposals for Stage 4, Desk-based Studies, in areas which have made a decision to participate. It sets out firstly how Potential Candidate Sites could be identified, then how they would be assessed and finally how decisions will be made about any that may go forward for further assessment in Stage 5. Criteria that were consulted on and subsequently published in the MRWS White Paper will be used, initially at a high level in the identification process, and then in more detail, to assess which Potential Candidate Sites might be suitable to proceed to Stage 5.
- 3.12 The proposed approach set out in this consultation follows from the commitment given in the MRWS White Paper that NDA, as Government's implementing organisation, will further develop proposals for site assessment. The consultation has been developed with input from a number of stakeholders and an early NDA technical note¹⁰ that was published for comment as part of its development.

¹⁰ NDA, *Technical Note: A proposed framework for Stage 4 of the MRWS Site Selection process* June 2008, www.nda.gov.uk/documents/upload/A-Proposed-Framework-for-Stage-4-of-the-MRWS-Site-Selection-Process-2008.pdf

4. Desk-based Studies: MRWS

Stage 4

- 4.1 Following a Decision to Participate¹¹, the geological disposal facility siting process will move into Stage 4: Desk-based Studies in participating areas. The purpose of Stage 4: Desk-based Studies is initially to identify Potential Candidate Sites and then to assess these in order to allow decisions to be made about any Candidate Sites that might go forward for more detailed investigation in the next stage, Stage 5: Surface-based Investigations.
- 4.2 It is important to make clear that the rock volumes and land areas identified as Potential Candidate Sites, and any subsequent Candidate Sites, could be considerably larger than would be required for a geological disposal facility. This is because in some parts of the UK, there is limited information about geological conditions far below the surface and there would be uncertainties about the depth, areal extent and thickness of the rock formation in which the waste would be emplaced (the “host rock”). In these cases the existing information available to desk-based studies may only allow a relatively high level geological assessment and the whole rock volume in which the host rock is thought to be present may be identified as a Potential Candidate Site. Therefore any Candidate Site taken through to Stage 5 for further, more detailed investigation could still extend over a relatively large area. For example non-intrusive geophysical surveys in Stage 5 could cover an area of the order of 20x30 kilometres in support of intrusive borehole investigations focused on area of say 5x10 kilometres.
- 4.3 There are two principal scenarios that could exist at the start of Stage 4:
- that a Decision Making Body/ies has taken a decision to participate covering one or more large areas within which Potential Candidate Sites would need to be identified; or
 - that a Decision Making Body/ies has taken a decision to participate with a smaller area/s which could already be equivalent to a Potential Candidate Site/s.
- 4.4 Where a Decision Making Body/ies has taken a decision to participate covering one or more large areas, Stage 4 will initially involve a high level identification of Potential Candidate Sites. As Potential Candidate Sites are identified the NDA, working closely with Community Siting Partnerships, will undertake assessments focusing on the suitability of those Potential Candidate Sites. The assessments will be mainly through desk-based studies and will involve gathering information about the Potential Candidate Sites (geoscientific information, demographic information, environmental information, topographic information etc.) and evaluating them against agreed criteria (geological setting, potential impact on people, potential impact on the natural environment and landscape etc.).

¹¹ The point at which a Decision Making Body/ies makes a formal commitment to participate in the geological disposal facility siting process, but ‘without commitment’ to eventually host the facility.

- 4.5 The proposed approach for identifying Potential Candidate Sites is set out from page 17 of this consultation. The process for assessment, once Potential Candidate Sites are identified, or where a Decision Making Body/ies has taken a Decision to Participate with a smaller area already broadly equivalent to a Potential Candidate Site, is set out from page 26.
- 4.6 As Government's implementing body, the NDA will provide the nuclear safety, geological and engineering input, as well as co-ordinate the site identification and assessment process. Government expects that a Community Siting Partnership will be set up to enable local partners and the NDA to work together and to engage in the siting process and time will be allowed for the Partnership to establish itself. As the process progresses, a Community Siting Partnership may find it useful to appoint experts to obtain supplementary advice, and wider scrutiny or review inputs from sources such as the independent regulators and CoRWM are also likely to be useful.
- 4.7 Local engagement with potential host community/ies¹² will be particularly important during this stage. In some cases, where larger areas are being considered, there could be many potential host communities even at the end of MRWS Stage 4. It may mean a Community Siting Partnership initially engaging representatives of existing local networks which represent parishes, towns or villages and then narrowing to representatives of groups of potential host communities as identification and assessment proceeds. Any potential host communities, or their representatives, should be engaged in a timely way and should have the ability to input to the process for identification of Potential Candidate Sites.
- 4.8 Safety is an essential requirement that runs through the entire site selection process and as far as is possible, given the information available, it will need to be assessed during Stage 4. As set out in the MRWS White Paper, the staged implementation approach allows design and development, safety, environmental and sustainability impacts, cost, affordability and value for money to be assessed before decisions are taken on how to move to the next stage. To this end, Government and the NDA will need to work with a Community Siting Partnership and Decision Making Body/ies throughout the site identification and assessment processes to consider and advise on the prospects for Potential Candidate Sites being successful in moving to Stage 5 of the site selection process.
- 4.9 The identification and assessment process must be consistent with the requirements of relevant environmental legislation, such as that on habitats and environmental assessments. As required under Strategic Environmental Assessment legislation¹³ the process must be developed and applied in a manner which identifies and assesses reasonable alternatives and in line with the procedural requirements set out in the directive¹⁴. At the end of desk-based studies, when any sites to be carried forward to the next stage of the process are identified, there will be a need to demonstrate that reasonable alternative sites within the

¹² The community in which any facility will be built. This will be a small geographically defined area and include the population of that area and the owners of the land. For example, it could be a town or village.

¹³ www.legislation.gov.uk/ukxi/2004/1633/contents/made

¹⁴ European Parliament and the Council of the European Union, "Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the Assessment of the Effects of certain Plans and Programmes on the Environment", Official Journal of the European Communities, L197, 2001.

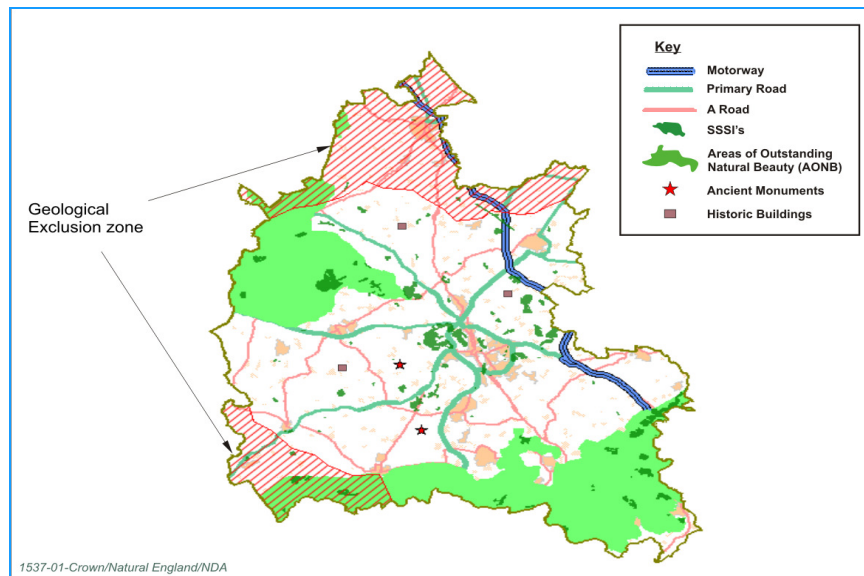
decision to participate area have been appropriately considered and that the procedural requirements of the directive have been met.

- 4.10 Decisions at the end of site identification and assessment are not based on a fixed number of Candidate Sites being carried into Stage 5. Following review by the independent regulators, as well as the ongoing scrutiny of the process by CoRWM, the output from the site identification and assessment would be used by a Community Siting Partnership and Decision Making Body/ies to help make a decision about whether or not to proceed to the next stage of the site selection process and with which Potential Candidate Site or appropriate selection of Potential Candidate Sites. The Government would then decide on an appropriate Candidate Site or Sites to take forward to Stage 5.
- 4.11 The following sets out in more detail proposals for how Potential Candidate Sites would be identified from larger 'Decision to Participate' area/s and how Potential Candidate Sites which are identified would be assessed. The final part of the consultation sets out how decisions will be made about any Candidate Site(s) that may go forward to Stage 5.

5. Identifying Potential Candidate Sites

- 5.1 This section sets out a proposed approach for identifying Potential Candidate Sites from one or more larger areas during Desk-based Studies, if this is required. Government does not want to be prescriptive about the approach, but the process for identifying Potential Candidate Sites must be structured, evidence based and open and transparent. It aims to enable a nationally consistent, high level approach across all areas for which there is a decision to participate. In order to provide local flexibility, participating communities, supported by Government and NDA, will be able to adapt or develop this framework to incorporate specific local issues, so that the final process is community owned.
- 5.2 The Government proposes that site identification should aim to identify potentially suitable host rocks and potentially suitable surface areas in parallel. Consideration would then be given to combinations of potentially suitable host rocks and surface areas.
- 5.3 Identification of Potential Candidate Sites will involve consideration of the local features and characteristics which could influence where a facility might be sited. For example, certain conservation areas or protected sites, depending on the nature of their protection, could be considered as either exclusion criteria or as a constraint on the identification of Potential Candidate Sites. It is not envisaged that identification will involve any detailed assessment, for example it will not involve an assessment of the potential impacts of a disposal facility on protected sites or conservation areas, as this type of assessment will be undertaken as part of the desk-based site assessment process outlined later in this consultation.
- 5.4 It is likely that geographic information systems (GIS) would be used as a method of capturing and analysing the information that will need to be used as part of site identification and presenting it in relation to a map of the 'decision to participate' area. This is commonly used in a wide range of planning and other processes. Figure 3 shows an example of a GIS map.

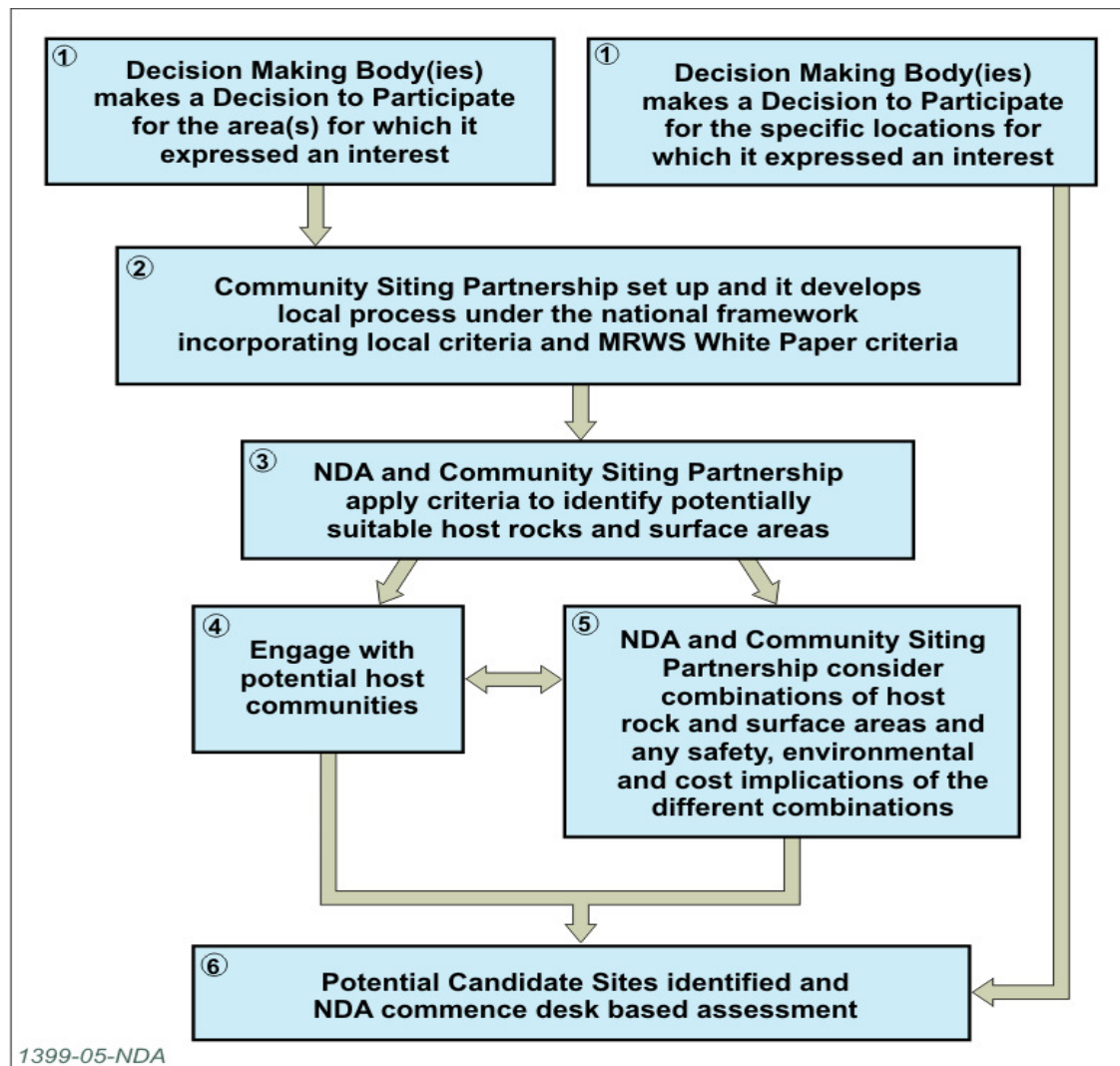
Figure 3: Example GIS map showing local features that might be relevant to the site identification process



Proposed national framework for identifying Potential Candidate Sites

5.5 Figure 4 below and the following paragraphs outline the proposed steps within a national framework for identifying Potential Candidate Sites from larger 'Decision to Participate' area/s. A Potential Candidate Site will be a combination of a volume of rock for the underground facility and a surface site for the surface facility. The framework is not meant to be onerous and although the steps set out in the figure are shown in sequence it might be that some of the work within certain steps could be undertaken in parallel with earlier steps. Where this is possible, and it is acceptable to a community siting partnership, then this would be encouraged. There may also be iterations between some of the steps.

Figure 4 Proposed national framework for the identification of Potential Candidate Sites



Step 1. The Decision Making Body/ies makes a Decision to Participate based on areas they have identified for consideration and taking into account any rock volumes that have been excluded earlier in the process by the British Geological Survey (BGS) sub-surface unsuitability test. Government accepts the Decision to Participate.

Step 2. After a Decision to Participate has been accepted by Government, it is expected that a Decision Making Body/ies would put in place a Community Siting Partnership to enable local stakeholders to be involved in the site identification and assessment process.

Through these partnership arrangements the community would decide how to apply the national framework for identifying Potential Candidate Sites to its local situation. The national framework uses a criteria-based approach to enable a wide range of issues to be considered. The proposed criteria are discussed in detail on page 21 but are, broadly speaking those set out in the MRWS White Paper as well as any specific local criteria that may be determined by a Community Siting Partnership. Members of a Community Siting Partnership would need to discuss and agree any

local criteria they would like to use in the site identification process as well as how these criteria will be used. National criteria would be applied consistently in conjunction with local criteria, although if it was considered useful in either the setting up of partnership arrangements or in developing local criteria, NDA could apply the national criteria earlier.

- Step 3. Working together, the NDA and the Community Siting Partnership would apply the agreed criteria to identify potentially suitable rock volumes and surface areas. It may be appropriate to adopt a tiered assessment process for the local criteria. For example, a pass/fail screening basis for some locally important criteria could be applied first, followed by a more focussed consideration of the national and remaining local criteria. The assessment would identify volumes of potentially suitable host rock and potentially suitable surface areas.
- Step 4. Once potentially suitable surface areas and host rocks have been identified, potential host communities, or groups of potential host communities, should start to become apparent and it will be important that a Community Siting Partnership begins to specifically engage representatives of these areas. This could be to explain those steps taken so far (steps 1-3) and to discuss how the process will be taken forward. This could result in revisions to the local criteria or their application. In this situation earlier steps could be repeated as necessary to further narrow the range of potentially suitable volumes of host rock and potentially suitable surface areas.
- Step 5. In parallel, consideration would be given to combinations of potentially suitable host rocks and surface areas (see Figure 1). With close involvement from community representatives, the NDA would lead this work which would need to consider both the total volume and the range of potentially suitable host rocks accessible from a potential surface area.

This work looking at possible underground and surface combinations would begin to identify Potential Candidate Sites. As they are identified an initial consideration of the safety and environmental implications as well as potential costs of implementing a geological disposal facility at specific sites would be undertaken. It would involve NDA conducting a high level review of the geoscientific information available to identify any early implications for the development of a safety case and engineering design. These considerations will take account of international guidance from the IAEA¹⁵ and any other relevant regulatory guidance.

A high level estimate of the potential costs of implementing a geological disposal facility would also be developed, taking into consideration the type of host rock and any potential issues associated with the Potential Candidate Site, for example distance from the surface site to the host rock.

This consideration of safety, environmental and cost implications would be a very high level review but could help focus the assessment on Potential Candidate Sites that show the most potential.

¹⁵ IAEA, *Siting of Geological Disposal Facilities: A safety Guide*, Safety Series No. 111-G-4 1, 1994.

Step 6. The steps above would identify Potential Candidate Sites that could be taken forward for desk-based assessment (set out from page 26).

Consultation Question	
1.	Do you agree with the proposed process to identify Potential Candidate Sites? If not, why not?
Consultation Question	
2.	Is there anything that could be included to improve the proposed process to identify Potential Candidate Sites, bearing in mind that physical site investigations will not start until later in the process?

Proposed criteria for identification of Potential Candidate Sites

- 5.6 It is proposed that site identification will use a criteria-based approach to enable a wide range of issues to be considered when identifying Potential Candidate Sites. This is consistent with the approach often used by local authorities to identify sites for local development including, for example, facilities for waste management or minerals extraction.
- 5.7 The proposed criteria are:
- the criteria set out in the White Paper;
 - local criteria determined by the local communities.
- 5.8 Each of these are considered in the following paragraphs. Some of the criteria relate to the host rock, some to the surface site and some to both. These would be considered in parallel to identify potential sub-surface rock volumes and surface areas that could then be combined together.

White Paper Criteria

- 5.9 The inclusion of the White Paper criteria to identify Potential Candidate Sites is proposed to ensure that both surface and sub-surface criteria are considered and to ensure consistency with the assessment of Potential Candidate Sites outlined later in this consultation. The White Paper criteria were derived from IAEA guidance¹⁶ on siting of facilities and from those criteria suggested by CoRWM¹⁷ to evaluate the suitability of potential sites. Additional criteria were derived from effects which have to be considered under the EU Directives on Strategic Environmental Assessment¹⁸, Environmental Impact Assessment¹⁹ and UK practice on sustainability appraisal²⁰. The MRWS White Paper Criteria are:

¹⁶ IAEA, *Siting of Geological Disposal Facilities: A safety Guide*, Safety Series No. 111-G-4 1, 1994.

¹⁷ CoRWM, "Implementing a Partnership Approach to Radioactive Waste Management: Report to Governments", CoRWM Document 2146, 2007. <http://corwm.decc.gov.uk>

¹⁸ European Parliament and the Council of the European Union, "Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the Assessment of the Effects of certain Plans and Programmes on the Environment", Official Journal of the European Communities, L197, 2001.

Office of the Deputy Prime Minister, Scottish Executive, Welsh Assembly Government and Department of Environment in Northern Ireland, "A Practical Guide to the Strategic Environmental Assessment Directive", 2005.

- geological setting;
- potential impact on people;
- potential impact on the natural environment and landscape;
- effect on local socio-economic conditions;
- transport and infrastructure provision;
- cost, timing and ease of implementation.

5.10 The following paragraphs outline what should be considered under each of the criteria to identify Potential Candidate Sites using existing information. Depending on the nature of the areas being considered the criteria could be exclusion criteria, constraints on siting, or provide an indication of a potentially suitable site. The nature of the criteria and how they will be used will need to be part of the local discussions on the application of the site identification process.

Geological setting

5.11 The high-level safety objectives of geological disposal are to isolate the waste from the biosphere and to contain the radionuclides associated with the wastes. To this end, the geological setting of a disposal facility provides an important barrier to the movement of radioactivity as well as providing protection from changes that may take place at the surface. There are many different geological settings that may potentially be suitable for a geological disposal facility. The consideration of the geoscientific information at this stage will involve looking at the areas not excluded by the sub-surface unsuitability test carried out by the BGS, to understand the likely presence, depth and thickness of potential host rocks in the likely 200 to 1000 metre depth range. Different levels of geoscientific information at depth will be available in different areas. As a result of this, the level of detail and the certainty with which a geological setting can be considered at this stage will also vary.

5.12 At this stage the potential for a given rock formation to be a host rock will be based on the generic characteristics of the rock type rather than the specific characteristics of the rock volume under consideration. These generic characteristics include the likely ability of the general rock type to provide suitable containment through its geomechanical, hydraulic and geochemical properties. It will take into account international experience of investigating potential host rocks for siting a geological disposal facility.

5.13 It is anticipated that contour maps of potential host rock thickness and depth will be produced for the areas not excluded by the BGS unsuitability screening to facilitate

¹⁹ Council of the European Communities, "Council Directive of 27 June 1985 on the Assessment of the Effects of Certain Public and Private Projects on the Environment (85/337/EEC)", as amended, Official Journal of the European Communities, C175, 1985. 28. European Commission, "Report from the Commission to the European Parliament and the Council On the Application and Effectiveness of the EIA Directive (Directive 85/337/EEC as Amended by Directive 97/11/EC)", 2003, Brussels.

European Parliament and the Council of the European Union, "Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 Providing for Public Participation in Respect of the Drawing up of Certain Plans and Programmes Relating to the Environment and Amending With Regard to Public Participation and Access to Justice Council Directives 85/337/ EEC and 96/61/EC", Official Journal of the European Communities, L156, 2003.

²⁰ Office of the Deputy Prime Minister, *Sustainability Appraisal of Regional Spatial Strategies and Local Development Documents*, 2005

the process. If there are areas where there is more limited geoscientific information available this will need to be indicated. The maps will be used to identify volumes of potentially suitable rock that could be used to host a geological disposal facility in terms of their size and characteristics.

- 5.14 Published BGS geological mapping information (1:10,000 scale for the majority of the UK), cross-sections and the supporting documentation²¹ will provide the primary source of information for this consideration which will also include the presence of aquifers on the basis of the Environment Agency classifications for the area.

Potential impact on people

- 5.15 Safety is a fundamental requirement and no facility will be allowed to operate unless it can be demonstrated to the independent regulators that safety and environmental requirements will be met both during operation as well as following closure. This will provide a high level of protection to people.
- 5.16 Safety and the protection of people will be considered in increasing detail during the site assessment process (described later in this consultation) as well as at all further stages of the MRWS process. For the purposes of site identification, the focus will be on identifying siting issues which may need to be taken into account at later stages.
- 5.17 Whilst the suitability of an underground facility to provide the level of safety required is considered under the 'Geological Setting' criteria, the 'Potential Impact on People' criteria will consider other aspects relevant to the siting of a surface. If relevant, this could for example, include a high level consideration of the proximity to existing hazardous facilities or operations (for example chemical plants) or to other facilities which may potentially impact on siting (for example hospitals). If possible at this point, this may also include consideration of national planning policies, such as those on flood risk vulnerability, and work to consider other natural hazards, such as coastal erosion. Consideration of such issues can inform the site selection process, but given the level of design and site specific safety information available at this stage, it might not exclude specific sites, rather it would highlight where there may be potential difficulties making a safety case.

Potential impact on the natural environment and landscape

- 5.18 In terms of potential impact on the natural environment and landscape, information will be available on a wide range of protected areas and features. This will include their geographic boundaries and the reasons for their protection. Areas important in a national or international context would include, for example, Sites of Special Scientific Interest (SSSIs), National Nature Reserves, Marine Nature Reserves, European sites (belonging to the Natura 2000 network²²), Areas of Outstanding Natural Beauty (AONBs), National Parks, Ancient Monuments and World Heritage Sites. Areas important in a more local context could include local nature conservation sites, special landscape areas, ancient woodland, conservation areas, listed buildings and so on.

²¹ The supporting documentation is called regional memoirs <http://www.bgs.ac.uk>.

²² http://ec.europa.eu/environment/nature/natura2000/index_en.htm

- 5.19 Although it would be a strategic level assessment, potential adverse effects on these protected areas or features could be viewed as either exclusionary criteria or as constraints on the siting of a geological disposal facility (or at least the surface facility), depending on their importance and on their sensitivity to its construction and operation.

Effect on local socio-economic conditions

- 5.20 Socio-economic issues that might have a bearing on the site identification process include, for example, levels of deprivation and local employment, the capacity of local public and community services, the location of development land and regeneration areas, existing land use, settlement patterns and population growth. Such considerations should take into account local development policies and priorities.
- 5.21 Information will be available on most of these issues in a form that could be plotted on a map. This would make it possible to see, for example, where potential socio-economic benefits (such as increased local employment) might be more or less desirable. Similarly, it might be possible to see where potential adverse effects, such as increased pressure on local public services, might be a problem.
- 5.22 Under this criterion potential impacts on existing, or future, facilities or industries in the area from implementing a disposal facility would be considered, as this could impact on the socio-economic development of the area. For example, the Office of Nuclear Regulation (ONR) requirements²³ mean that there could be implications for existing or future infrastructure and development. For example, there could be restrictions on other future industrial developments close to a geological disposal facility. These might not exclude a site from consideration at this stage, but where issues are identified, these would need to be reviewed when more detailed safety case information became available in the future.

Transport and infrastructure provision

- 5.23 The existing transport infrastructure within the area could be evaluated in terms of its capacity and links to other major infrastructure. This would include considering road, rail and sea links. Any obvious need for additional infrastructure or upgrading of existing infrastructure might be able to be identified. The additional use of the infrastructure could be estimated based on the NDA understanding of the transport movements needed to implement a geological disposal facility and transport radioactive waste to it.

Cost, timing and ease of implementation

- 5.24 The area would be considered in terms of characteristics which may affect the feasibility, cost and timing of building the surface and underground facilities associated with the geological disposal facility. If a specific surface site was being considered at this stage, this might for example consider whether it was large

²³Health and Safety Executive Nuclear Directorate, Land Use Planning and the Siting of Nuclear Installations in the United Kingdom.

Health and Safety Executive, The Licensing of Nuclear Installations.

Health and Safety Executive, Safety Assessment Principles for Nuclear Facilities, 2006 Edition, Revision 1.

enough to accommodate a surface facility or whether a specific surface landscape might make it more complicated to site a surface facility.

- 5.25 Geoscientific information would be used to consider the possible size and nature of the underground layouts for the geological disposal facility. For example, whether the facility could be developed on one level or whether there might need to be two levels of vaults. This would give an indication of the size and complexity of the potential underground development and the relative ease of implementation. The scale of the costs of implementing a facility in the particular type of host rock could also be estimated.

Local Criteria

- 5.26 Local communities may have additional considerations which they would like to be taken into account in the identification of Candidate Sites, in addition to the national criteria identified above. If this is the case it would be for the Community Siting Partnership to identify additional local criteria to be applied as part of site identification.
- 5.27 A potential use of local criteria would be to incorporate key local planning policies into the site identification process in order that Potential Candidate Sites appropriately reflect local development policies and priorities. In particular, for a surface facility, this might include relevant policies relating to the classification of land and to major development proposals. Local criteria might also potentially be used to reflect any significant feedback from previous local engagement.
- 5.28 The Government does not wish to unduly constrain community flexibility in either the nature of any local criteria which may be identified or the way in which local criteria are applied. Care will need to be taken to ensure that the local criteria are clear and the approach to their identification and application does not undermine the credibility of the site identification process. Any local planning criteria would need to be explicitly derived from planning policies and particular care would need to be taken if local communities were to suggest application of existing site allocation policies to what is a very specific national facility.

Consultation Question	
3.	Do you agree with the proposal to use local and national criteria to identify Potential Candidate Sites? If not, why not?
Consultation Question	
4.	Do you agree with the proposed criteria for identifying Potential Candidate Sites? If not, why not?

6. Assessing Potential Candidate Sites

- 6.1 Once Potential Candidate Sites start to be identified the Government will ask the NDA to assess them using the criteria outlined in the White Paper. The objective of the assessments is to identify which Potential Candidate Sites are most likely to be suitable for hosting a geological disposal facility and could be subject to more detailed investigations in Stage 5 of the MRWS site selection process.
- 6.2 If a Decision Making Body/ies has taken a decision to participate with a smaller area/s which could already be equivalent to a Potential Candidate Site/s it will not have gone through the identification process. In that situation, before the NDA could undertake any assessment, it would conduct a very high level review of the safety, environmental and cost implications, using available information to identify any early implications for the development of a safety case and engineering design. This would be a similar review to that undertaken as part of step 5 of the site identification process set out on page 20.
- 6.3 Desk-based site assessment has to be developed at a national level as it needs to be consistently applied to any Potential Candidate Site that followed from any decision to participate. Before any work is undertaken at a local level, the criteria to be used in the desk-based assessment will need to be finalised as will scoring scales against each of these criteria. This is part of the aims of this consultation.
- 6.4 Desk-based site assessment will include some consideration of the potential impacts associated with the implementation of a geological disposal facility at the Potential Candidate Sites, for example the potential impacts of implementing a geological disposal facility on an AONB in any area or the need for new transport infrastructure and the impacts that might have.
- 6.5 Existing information will be used to support the assessment process. At this assessment stage, there may be less detailed information available to assess at some rock volumes or land areas than at others. In particular, this could be the case if a large rock volume has been identified as part of a Potential Candidate Site. Information gathered through the Strategic Environmental Assessment and any Habitats Regulations Assessment will also be a key source of information. Although it is anticipated that there will be sufficient geological information available to allow site assessment to be carried out, it might be that some non-intrusive surveys such as geophysical surveys could provide further useful information and if so, the NDA would discuss with the Community Siting Partnership whether such surveys should be carried out.
- 6.6 The following sections, and Figure 5 below, outline a proposed approach for assessing Potential Candidate Sites using the criteria outlined in the White Paper. It is proposed that an approach based on multi criteria decision analysis (MCDA) should be used to assess Potential Candidate Sites. MCDA is a decision aiding process that uses set criteria and scoring scales to evaluate how well options perform, these are combined with a weighting process for the criteria, based on

stakeholders' views, to show how the evaluation of the options changes depending on the relative importance of the criteria. It is an analysis tool useful where there are multiple options and several, sometimes conflicting criteria against which the options need to be evaluated. Graphical displays can be developed showing how options perform against criteria and how they do this in different ways. The MCDA model that is created is a vehicle that allows decision makers to explore the effects of uncertainty in the data and differences of opinion between stakeholders.

- 6.7 The purpose of MCDA is to aid thinking and decision making, but not to actually take the decision. MCDA is open and transparent, it provides an audit trail, scores and weights applied to criteria are explicit and are developed according to established techniques and it can also provide a useful means of communicating and considering complex information with stakeholders.
- 6.8 In this case, MCDA will enable Potential Candidate Sites to be evaluated against the criteria outlined below. It will enable decision makers to understand how the Potential Candidate Sites might differ from one another and how their overall scores would change if different assumptions or weightings were used. It will also provide a structured way to ensure a wide range of stakeholders is involved in the site assessment process. In particular, it will allow stakeholders' views on the importance of the different criteria to be evaluated and their impact on the range of scores of Potential Candidate Sites to be understood.
- 6.9 MCDA is a technique which is increasingly being used in the UK²⁴ and is consistent with the approach used by local authorities to screen and assess sites for major facilities as well as the approach used by the Department for Transport to appraise transport projects and proposals in the UK²⁵. MCDA was also used by CoRWM to evaluate radioactive waste management options in earlier stages of the MRWS programme and has also been used in other programmes internationally. However, it is not the only approach which can be used to support decision making and many decisions by Government and Local Authorities are made without using MCDA.

Consultation Question

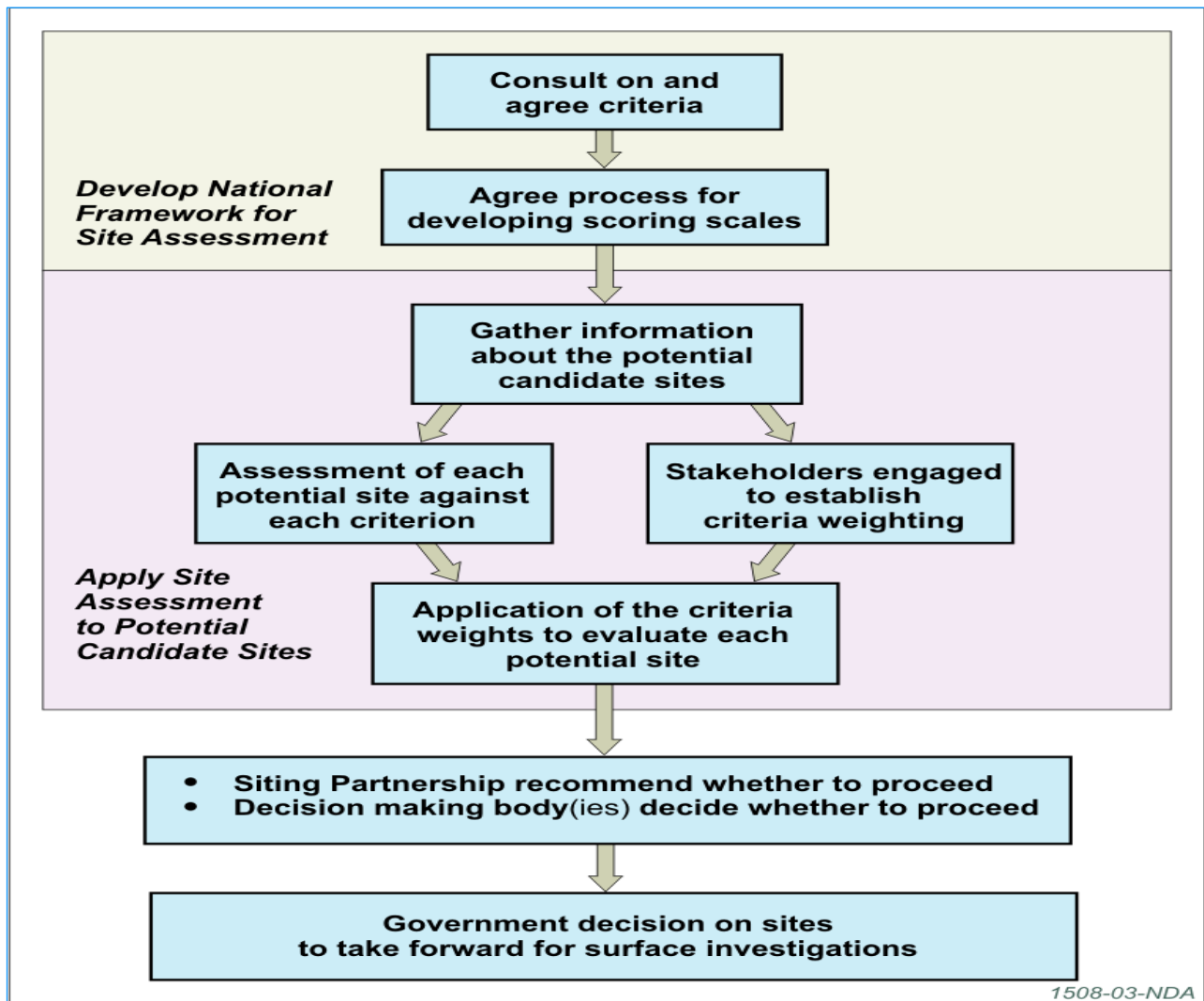
5.	Do you feel a multi-criteria decision analysis (MCDA) should be used to assess Potential Candidate Sites? If not, why not, and what approach do you think should be used?
----	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

- 6.10 The criteria for an MCDA process, and the way in which Potential Candidate Sites would be assessed against the criteria, will be developed at a national level to ensure consistent application. Figure 5 outlines how the process would be undertaken in practice and the following sections then outline what would be involved in each of the steps in the diagram.

²⁴ Communities and Local Government - 'Multi-criteria analysis: a manual'
www.communities.gov.uk/documents/corporate/pdf/1132618.pdf

²⁵ See www.dft.gov.uk/pgr/economics/rdg/anintroductiontotransportana3042.

Figure 5: Overview of the Multi-criteria Decision Analysis Process



Developing the national MCDA framework

Proposed criteria for site assessment

6.11 As set out in the Identification of Potential Candidate Sites section of this consultation, the MRWS White Paper set out broad criteria that could be used to evaluate Potential Candidate Sites. These proposed criteria are set out below.

- geological setting;
- potential impact on people;
- potential impact on the natural environment and landscape;
- effect on local socio-economic conditions;
- transport and infrastructure provision;
- cost, timing and ease of implementation.

6.12 The MRWS consultation document prior to the White Paper also set out the types of issues which the criteria could be interpreted to cover. Taking into consideration

responses received to the consultation, the broad criteria have been further developed into the more detailed criteria set out below.

- 6.13 Following this consultation and subsequent responses, the Government may further develop or refine the criteria as appropriate. For some of the criteria, for example geological setting, there may not be any further information available at the assessment stage than there was at the site identification stage. In this case the information used during the site identification process will be reconsidered using the more detailed criteria outlined below. As part of Stage 4 of the MRWS programme the NDA will be undertaking a number of environmental assessments of the proposals for implementing geological disposal. These will include a Strategic Environmental Assessment (SEA), a Strategic Transport Assessment²⁶, a Health Impact Assessment²⁷, an Equality Impact Assessment²⁸ and any Habitats Regulations Assessment that may be required. These assessments will provide information into the site assessment process, for example, for the criteria relating to the potential impact on the natural environment and landscape.
- 6.14 Some of the proposed criteria relate to the sub-surface, some to the surface and some to both. All the aspects of the criteria will be considered in the assessment. Care will be taken during the assessment to ensure that there is no double counting, for example in terms of considering the impacts of transport more than once in the assessment.

Geological setting

- 6.15 The geological setting of a disposal facility is key to the achievement of long-term safety. The proposed criteria are derived in part from the Environment Agency's response²⁹ to the MRWS consultation document and are as follows:
- the likely size of the potentially suitable volume of host rock;
 - the likely level of technical challenges from construction and engineering conditions and the availability of knowledge and technology by which they could be overcome;
 - the level of difficulty to ultimately characterise the Potential Candidate Site;
 - a qualitative assessment of the feasibility of developing a robust safety case, based on available geoscientific information (including known geological, hydrogeological and hydrological characteristics).
- 6.16 The final three bullets take into account the impact of the complexity of the geology on the safety case, engineering design and site characterisation as this is an important factor identified in the IAEA guidance³⁰.

²⁶ Department for Transport, *Guidance on Transport Assessment* (ISBN 978-0-11-552856-9), March 2007.

²⁷ Department of health, *Draft guidance on health in strategic environmental assessment – consultation document*, 2007.

²⁸ Equality and Human Rights Commission, *Equality Impact Assessment Guidance* (ISBN 978-1-84206-240-1), November 2009.

²⁹ The Environment Agency, Response to Consultation by Defra, Dti and the Welsh and Northern Irish Devolved Administrations "Managing Radioactive Waste Safely: A Framework For Implementing Geological Disposal", 2007.

³⁰ IAEA, *Siting of Geological Disposal Facilities: A safety Guide*, Safety Series No. 111-G-4 1, 1994.

Potential impact on people

6.17 The proposed criteria are:

- impacts on human health, well-being and safety during the site investigations, construction, operation and closure of the facility;
- impacts on other human activities, social (e.g. recreation facilities, parks) and industrial (e.g. farming, tourism, food production);
- level of nuisance or disturbance created (noise, dust, visual impacts, excluding transport impacts);
- impact on local cultural heritage, including architectural and archaeological heritage, landscape and the interrelationships between these factors, and land use requirements.

Potential impact on the natural environment and landscape

6.18 The proposed criteria are:

- impacts on flora, fauna, biodiversity, air quality, water, soil, carbon emissions, landscape, visual aspects and climatic factors;
- impacts on national parks, areas of outstanding natural beauty, sites of special scientific interest and in accordance with the Habitats Directive, European designated sites;
- impacts on nationally important buildings or monuments.

Effect on local socio-economic conditions

6.19 The proposed criteria are:

- impacts on provision of employment, economic growth and regeneration opportunities;
- potential impacts of population changes;
- potential impacts on current and future industries and facilities in the area.

Requirement for transport and infrastructure provision

6.20 The proposed criteria are:

- extent of transport requirements;
- impacts of transport operations and the required transport infrastructure on people and the environment;
- availability of existing non transport infrastructure (e.g. electricity and water supply).

6.21 The above has overlaps with the criteria associated with the potential impacts on people as well as that on the natural environment and landscape, and care will be taken during the MCDA to ensure that there is no double counting.

Cost, timing and ease of implementation

6.22 The proposed criteria are:

- duration and cost of site characterisation and assessment;
- cost of construction, operation and closure (including consideration of flood risk);
- use of natural resources and material assets;
- challenges from handling of non-radioactive wastes from construction activities (for example, rock spoil, drained groundwater).

Consultation Question

6.	Are there any additional criteria that could realistically be considered at this stage in the process to assess Potential Candidate Sites?
----	---------------------------------------------------------------------------------------------------------------------------------------------------

Developing scoring scales

6.23 Performance against each criterion must be capable of being given a value, in the sense that it must be possible to assess, at least in a qualitative sense, how well a particular site is expected to perform in relation to the criterion. Scoring scales will describe the extent to which a Potential Candidate Site meets a particular criterion and each criterion will require its own scale. The scoring scales need to be objective and will need to be developed with input from experts in each of the areas covered by the criteria. The scoring scales will ensure a consistent approach to the assessments.

6.24 With input from stakeholders, NDA will identify the relevant experts who hold knowledge and expertise about the different criteria and who should be involved in the development of the scoring scales. The scoring scales will be developed through a series of workshops, with individual workshops arranged for each of the high level criteria outlined above. The scoring scales will be developed following this consultation and after publication of the criteria.

6.25 Scoring scales of between 1 and 9 or between 1 and 100 are often used in MCDA, where 1 indicates the minimum level of acceptability against a given criterion and 9 or 100 the highest. A short description of what leads to a given score is also produced to ensure a consistent approach is used when assessing individual options and to ensure that the process is transparent to people not directly involved. It is proposed that a scoring scale of 1 to 9 is used for this process as this is felt to give an appropriate level of precision given the limited amount of information that may be available on each of the criteria at this stage in the MRWS process.

6.26 An example of a 1-9 scoring scale is that used by CoRWM in their assessment of noise impacts for waste management options. CoRWM considered the extent to

which the option (local facility) was expected to create a noise impact on a single individual. The scoring scale that was developed³¹ is shown in the following table.

Table 1: CoRWM MCDA scoring scale used to assess noise in waste management options

Extent to which the option meets the specified criterion	Description of option's performance against the criterion
9	Very Well. No detectable increase in noise at site boundary.
7	Well
5	Moderately
3	Poorly
1	Very Poorly. The loudest noise over the longest cumulative period, that just meets regulatory norms.
0	Unacceptable. Does not meet regulatory norms for noise.

Applying the MCDA process to Potential Candidate Sites

6.27 Once the criteria and scoring scales have been agreed Potential Candidate Sites can be evaluated against them. The following sections outline what would be involved in the assessment.

Gather information about the Potential Candidate Sites

6.28 Information about each of the Potential Candidate Sites relating to each of the criteria will need to be gathered. The NDA will work with a Community Siting Partnership and any relevant experts in each of the criteria to gather information about the Potential Candidate Sites. This will involve collating existing information such as information on sites of special scientific interest, road and rail networks and existing geoscientific information as well as possibly gathering additional new information (for example wildlife surveys, environmental surveys etc.).

6.29 A Decision Making Body/ies or other relevant local bodies are likely to be good sources of much of this information and local input will be important. The NDA will work with a Community Siting Partnership to identify this information and to consider how it could be used.

Assessment of each Potential Candidate Site against each criterion

6.30 Potential Candidate Sites will need to be evaluated to see how well they perform against the criteria. The assessment should be rigorous and as objective as possible and will need to involve a group of experts who have the relevant knowledge and expertise on the different criterion being considered. NDA will

³¹ Set out Catalyze Limited, *CoRWM Initial Specialist Workshops 15/16th, 22/23rd June & 6/7th July 2005*, CoRWM Document 1256, 2005, available at <http://corwm.decc.gov.uk/documentstore/advancedsearch.aspx>

discuss with stakeholders, especially the Community Siting Partnership, which experts should be involved. The groups of experts who were involved in developing the scoring scales could be invited to participate in the assessments and a Community Siting Partnership may want to appoint their own experts to be involved in the assessments either as part of the workshops or in an independent review capacity.

- 6.31 The assessments of Potential Candidate Sites will most likely be undertaken via a series of individual expert workshops each focussed on one or more of the criteria where the relevant experts will assess each Potential Candidate Site against each criterion using the information that had been gathered. NDA would manage the process and work with an independent facilitator to ensure that all the workshops have a consistency of approach and do not operate in isolation from one another.
- 6.32 Any differences in expert opinion would be recorded in the MCDA model and would be investigated as part of the evaluation of the Potential Candidate Sites to determine the impact on the overall score of the Potential Candidate Sites.

Establish Criteria Weighting with stakeholders

- 6.33 MCDA requires the relative importance of the different criteria to be determined to feed into the MCDA model. For example, some stakeholders may think that potential impacts on people are more important than potential impacts on the natural environment and would like to give more importance to those criteria. This would result in them giving a higher weight to those criteria in the MCDA model to reflect their relative importance.
- 6.34 NDA will work with a Community Siting Partnership to organise workshops with stakeholders to understand their views about the relative importance of the different criteria so that they can be fed into the evaluation. The weighting of the criteria is subjective and different stakeholders may have different views about the relative importance of the different criteria. Such differences in view would be investigated as part of the evaluation of the Potential Candidate Sites to see if it affects their overall score.

Application of the criteria weights to evaluate each Potential Candidate Site

- 6.35 Once the Potential Candidate Sites had been assigned a score against each evaluation criterion and different weights for the criteria had been determined, the Potential Candidate Sites could be given an overall score. This involves multiplying the score a Potential Candidate Site has been given for each criterion with the weight given to that criterion and adding all the weighted scores together to give an overall score. An example of this being applied in practice is given in Box 1.
- 6.36 The different weights given to the criteria by different stakeholders would be fed in to the model to investigate what impact this had on the overall score of the Potential Candidate Sites. Any difference in view about the scores of the Potential Candidate Sites against individual criterion would also be investigated at this stage. These studies are often called sensitivity analyses as they explore the sensitivity of the overall scores to changes in the weighting of the criteria and individual scores against the criteria. If the overall score of the Potential Candidate Sites varied

significantly when different weightings were used for the criteria or when the different scores were used, then more work may be needed.

- 6.37 The results of the assessments would be written up into a Desk-based Assessments Report for the Potential Candidate Sites. The report would provide a matrix of overall scores for each Potential Candidate Site showing how differences in the weighting of the criteria affect the evaluation of the Potential Candidate Sites. It would outline any strengths and weakness of the Potential Candidate Sites and where there may be uncertainties associated with the assessment process. It would also provide an overview of the assessment process itself and would include a clear audit trail to all the more detailed reports associated with each step of the assessment.
- 6.38 The Desk-based Assessments Report will not itself produce a decision. Rather, it will outline whether the Potential Candidate Sites are suitable for further investigation in Stage 5 of the MRWS process and how they perform against each of the criteria.

Box 1: MCDA Scoring Matrix Example

This table shows an example of a scoring matrix for evaluating cars. The overall score for each car is the sum of the scores against the individual criterion multiplied by the weight of the individual criterion. For example, the overall score for the car 1 is:

$$(0.2 \times 100) + (0.3 \times 50) + (0.2 \times 20) + (0.1 \times 30) + (0.5 \times 50) = 67$$

Table 2: An example of a results table from an MCDA on cars

	Price	Safety	Fuel Economy	Comfort	Performance	Overall score
Criteria Weights	0.2	0.3	0.2	0.1	0.5	
Option						
Car 1	100	50	20	30	50	67
Car 2	20	30	60	100	20	45
Car 3	40	40	50	20	30	47

Review and scrutiny

- 6.39 The Desk-based Assessments Report would be made available for discussion and review by the regulators and the Community Siting Partnership which may already have, or want to appoint, its own experts. As well as a review of the outputs, it would be important to ensure that there was scrutiny and comment on the MCDA process itself. CoRWM will provide scrutiny and any advice on the ongoing process

and they may also comment on the Report produced if asked to do so by Government.

- 6.40 In addition, the independent regulators might review the Report and provide comment and advice on regulatory matters such as environmental and nuclear safety or security and safeguards.
- 6.41 Further work may need to be undertaken if the reviews and scrutiny highlight any issues that need to be addressed. A final Desk-based Assessments Report would be fed into the local decision making process about whether to proceed to MRWS Stage 5 with certain Potential Candidate Sites .

Consultation Question

- | | |
|----|----------------------------------------------------------------------------------------------------------------------------|
| 7. | Do you have any comments on the way we propose to use MCDA to assist in structured, evidence based decision making? |
|----|----------------------------------------------------------------------------------------------------------------------------|

7. Decision making

- 7.1 As previously mentioned, the purpose of MCDA is to serve as an aid to thinking and decision making, but not to actually take the decision. MCDA will enable Potential Candidate Sites to be evaluated against the criteria and will enable decision makers to understand how the Potential Candidate Sites differ from one another and how their overall scores would change if different assumptions or weightings are used.
- 7.2 In recommending and deciding whether to proceed to MRWS Stage 5 a Community Siting Partnership and Decision Making Body/ies are likely to want to consider a range of evidence. Clearly, a key input will be the final Desk-based Assessments Report, in particular when it comes to the local decision making process about an appropriate selection of Candidate Sites that might be put forward to surface-based investigations. But there may also be other considerations that need to be taken into account for example the extent of local support.
- 7.3 The decision making process will be staged:
- The Community Siting Partnership would make recommendations to local Decision Making Body/ies about whether to proceed to the next stage of the site selection process and with which Potential Candidate Sites .
 - The Decision Making Body/ies would decide whether to proceed to the next stage of the site selection process and if so with which Potential Candidate Sites.
 - The Government would then decide on one or more Candidate Sites to take forward to Stage 5.
- 7.4 Government's decision making process will also need to take into account additional information for example, the draft findings of the environmental assessments of the proposals for implementing geological disposal that the NDA will have undertaken. These will include a Strategic Environmental Assessment, a Strategic Transport Assessment, a Health Impact Assessment, an Equality Impact Assessment and any Habitats Regulations Assessment undertaken.
- 7.5 The range of geological settings available from those Potential Candidate Sites put forward by a Decision Making Body/ies will also be taken into account. Where Decision Making Bodies are content that multiple Candidate Sites move forward to MRWS Stage 5, Government will want to select an appropriate site, or mix of sites, to carry forward. If considering multiple sites Government may consider issues such as the appropriate level of diversity between Candidate Sites as well as their individual characteristics.
- 7.6 Any Potential Candidate Sites which move forward into Stage 5 (surface-based investigations), will be subject to increasingly detailed assessments, with resources becoming focussed on investigating those that are most likely to be suitable. This would initially include surface-based investigations, for example non-intrusive seismic surveys and then later the drilling of boreholes which would be the start of statutory regulation.

Annex A - Summary of Questions

Consultation Question		
1.		Do you agree with the proposed process to identify Potential Candidate Sites? If not, why not?
2.		Is there anything that could be included to improve the proposed process to identify Potential Candidate Sites, bearing in mind that physical site investigations will not start until later in the process?
3.		Do you agree with the proposal to use local and national criteria to identify Potential Candidate Sites? If not, why not?
4.		Do you agree with the proposed criteria for identifying Potential Candidate Sites? If not, why not?
5.		Do you feel a multi-criteria decision analysis (MCDA) should be used to assess Potential Candidate Sites? If not, why not, and what approach do you think should be used?
6.		Are there any additional criteria that could realistically be considered at this stage in the process to assess Potential Candidate Sites?
7.		Do you have any comments on the way we propose to use MCDA to assist in structured, evidence based decision making?

Annex B - Glossary

Committee on Radioactive Waste Management (CoRWM)

CoRWM was set up in 2003 to provide independent advice to Government on the long-term management of the UK's solid higher activity radioactive waste. In October 2007, CoRWM was reconstituted with revised Terms of Reference and new membership. The Committee will provide independent scrutiny and advice to UK Government and devolved administration Ministers on the long-term radioactive waste management programme, including storage and disposal. Further information available at <http://corwm.decc.gov.uk/>.

Community Siting Partnership (or Partnership)

A partnership of local community interests that will work with the NDA's delivery organisation and with other relevant interested parties to ensure questions and concerns of potential Host Communities and its Wider Local Interests are addressed and resolved as far as reasonably practicable and to advise Decision Making Bodies at each stage of the process.

Decision Making Body

The Local Government decision-making authority for the host community.

Environment Agency

The environmental regulator for England and Wales. The Agency's role is the enforcement of specified laws and regulations aimed at protecting the environment, in the context of sustainable development, predominantly by authorising and controlling radioactive discharges and waste disposal to air, water (surface water, groundwater) and land. The Environment Agency also regulates nuclear sites under the Environmental Permitting Regulations and issues consents for non-radioactive discharges.

Environmental Impact Assessment (EIA)

A legal requirement under EU Directive 85/337/EEC (as amended) for certain types of project, including various categories of radioactive waste management project. It requires information on the environmental impacts of a project proposal to be submitted by the developer and evaluated by the relevant competent authority (the planning authority, HSE or other regulators concerned).

Equality Impact Assessment (EqIA)

An Equality Impact Assessment considers the likely effects of a policy, plan or project on a variety of social groups, mainly focussing on the protected characteristics established under the Equality Act 2010: age, disability, gender reassignment, pregnancy and maternity, race, religion or belief, sex and sexual orientation. It helps to ensure that proposals will not result in discrimination against any individual or community and where possible will promote equality.

Expression of Interest (Eoi)

The decision point at which local communities register their 'without commitment' interest in discussions with Government about potential involvement in the geological disposal facility siting process.

Geological disposal

A long term management option involving the emplacement of radioactive waste in an engineered underground geological disposal facility or repository, where the geology (rock structure) provides a barrier against the escape of radioactivity and there is no intention to retrieve the waste once the facility is closed.

Habitats Regulations Assessment

In this document, Habitats Regulations Assessment refers to the type of assessment legally required by EC Directive 92/43/EEC in the preparation of certain plans and projects. The relevant "competent authority" must assess and report on the predicted effects of the plan or project on "European sites" and associated "European protected species".

Health and Safety Executive (HSE)

A statutory body whose role is the enforcement of work related health and safety law. HSE is the licensing authority for nuclear installations. The HSE exercises this delegated authority through the Office of Nuclear Regulation who are responsible for regulating the nuclear, radiological and industrial safety of UK nuclear installations under the Nuclear Installations Act 1965.

Health Impact Assessment (HIA)

A combination of procedures, methods and tools by which a policy, programme or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population.

High Level Waste (HLW)

Radioactive wastes in which the temperature may rise significantly as a result of their radioactivity, so this factor has to be taken into account in the design of storage or disposal facilities.

Higher activity radioactive waste

It includes the following categories of radioactive waste: high level waste, intermediate level waste, a small fraction of low level waste with a concentration of specific radionuclides.

Host Community

The community in which any facility will be built. This will be a small geographically defined area and include the population of that area and the owners of the land. For example, it could be a town or village.

Intermediate level waste (ILW)

Radioactive wastes exceeding the upper activity boundaries for low level radioactive waste but which do not need heat to be taken into account in the design of storage or disposal facilities.

International Atomic Energy Agency (IAEA)

The IAEA is the world's center of cooperation in the nuclear field. It was set up in 1957 as the world's "Atoms for Peace" organization within the United Nations family. The Agency works with its Member States and multiple partners worldwide to promote safe, secure and peaceful nuclear technologies

Low Level Waste (LLW)

LLW is defined as “radioactive waste having a radioactive content not exceeding 4 gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma activity”.

Managing Radioactive Waste Safely (MRWS)

Government's programme of work for the long term management of the UK's higher activity radioactive waste. It covers the whole process of public consultation, work by CoRWM, and subsequent actions by Government, to identify and now implement geological disposal, coupled with safe and secure interim storage and ongoing research and development.

Nuclear Decommissioning Authority (NDA)

The NDA is the implementing organisation, responsible for planning and delivering geological disposal. 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 (initially British Nuclear Group Sellafield Limited, Magnox Electric Limited, Springfields Fuels Limited and UK Atomic Energy Authority). 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 (currently the Secretary of State for Energy and Climate Change) and Scottish Ministers.

Office for Nuclear Regulation (ONR)

The ONR maintains and improves safety standards for work with ionising radiation at licensed nuclear installations. It sets national regulatory standards and helps develop international nuclear safety standards. Through its licensing powers it assesses safety cases and inspects sites for licence compliance. The ONR sets out in conditions attached to a nuclear site licence the general safety requirements to deal with the risks on a nuclear site.

Potential Candidate Site

A Potential Candidate Site is a combination of a surface site for the surface facility and a volume of rock for the underground facility. The land areas and/or rock volumes identified during the process described in this consultation document could be considerably larger than would be required for a geological disposal facility. Any Candidate Site taken through to Stage 5 for further, more detailed investigation could still extend over a relatively large area.

Radioactive waste

Any material contaminated by or incorporating radioactivity above certain thresholds defined in legislation, and for which no further use is envisaged, is known as radioactive waste.

Radioactive Waste Management Directorate (RWMD)

An NDA Directorate established to design and build an effective delivery organisation to implement a safe, sustainable, publicly acceptable geological disposal programme. It is envisaged that this directorate will become a wholly owned subsidiary company of the NDA. Ultimately, it will evolve under the NDA into the organisation responsible for the delivery of the geological disposal facility. Ownership of this organisation can then be opened up to competition, in due course, in line with other NDA sites.

Right of Withdrawal (RoW)

This is an important part of the voluntarism approach intended to contribute to the development and maintenance of community confidence. Up until a late stage, when underground operations and construction are due to begin, if a community wished to withdraw then its involvement in the process would stop.

Spent fuel (Spent nuclear fuel)

Used fuel assemblies removed from a nuclear power plant reactor after several years use and treated either as radioactive waste or via reprocessing as a source of further fuel.

Stakeholders

In the context of this document, people or organisations, having a particular knowledge of, interest in, or being affected by, radioactive waste, examples being the waste producers and owners, waste regulators, non-Governmental organisations and local communities and authorities.

Strategic Environmental Assessment (SEA)

In this document, SEA refers to 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.

Strategic Transport Assessment (STA)

In this document, Strategic Transport Assessment refers to an assessment of the potential transport effects of a proposed plan or programme. An Strategic Transport Assessment also identifies what measures may be required to deal with adverse transport effects and to improve accessibility and safety, especially for pedestrians, cyclists and public transport users.

Sustainability Appraisal (SA)

A form of assessment used in England, particularly in regional and local planning, covering the social, environmental and economic effects of proposed plans and appraising them in relation to the aims of sustainable development. SAs fully incorporating the requirements of the SEA Directive (2001/42/EC) are mandatory for a range of regional and local planning documents under the Planning and Compulsory Purchase Act 2004.

Voluntarism

An approach in which communities “express an interest” in participating in the process that would ultimately provide the site for a geological disposal facility. Initially a community would be expressing an interest in finding out more about what hosting such a facility would involve. In the latter stages there would be more detailed discussion of plans and potential impacts.

