Committee on Radioactive Waste Management

CoRWM REPORT TO GOVERNMENT

GEOLOGICAL DISPOSAL OF HIGHER ACTIVITY RADIOACTIVE WASTES

JULY 2009

CONTENTS

INTRODUCTION BY THE CHAIR

This is one of three CoRWM reports to Government in 2009. The reports are about:

- interim storage of higher activity wastes (including waste conditioning, packaging and transport, and the management of materials that may be declared to be wastes)
- the implementation of geological disposal of higher activity wastes (this report)
- research and development for interim storage and geological disposal.

The reports cover the three strands of the Government's *Managing Radioactive Waste Safely* programme. They contain the results of CoRWM's scrutiny, during 2008 and the first part of 2009, of the work of the Government, the Nuclear Decommissioning Authority, other nuclear industry organisations, the regulators, local authorities and various organisations that carry out research. The recommendations in the reports are to Government but also affect others.

Robert Pickard
31 July 2009

EXECUTIVE SUMMARY

1. Publication on 12 June 2008 of the White Paper, "Managing Radioactive Waste Safely – A Framework for Implementing Geological Disposal", marked an important stage in the developing programme for the management of higher activity radioactive wastes in the United Kingdom.

2. CoRWM's work on the process for implementing geological disposal since that date has been:

    - to monitor the interest of local communities in responding to the invitation to express an interest in opening up without-commitment discussions on the possibility of hosting a geological disposal facility at some time in the future
    - to enter into a dialogue with the Nuclear Decommissioning Authority (NDA), the regulators and others about how each of them will play their part in the delivery of the Managing Radioactive Waste Safely (MRWS) programme
    - to avail the Committee of international experience.

3. All of this has led to CoRWM scrutinising the implementation of geological disposal and advising on the process when requested. The following are its conclusions and recommendations.

The Invitation to Participate in the Siting Process for Geological Disposal

The White Paper

4. CoRWM is pleased that, in so far as geological disposal is concerned, the White Paper has closely followed CoRWM's earlier recommendations and advice. CoRWM is strongly supportive of the voluntarism and partnership approach to site selection set out in the White Paper.

Engaging with Local Communities

5. It is of concern that, at this time, only one part of the UK has come forward with Expressions of Interest. This is particularly so since the geological, technical, environmental and social suitability of any area that expresses an interest will remain unclear for some years.

6. Therefore, there is both a need and still time to publicise the invitation to participate more widely. CoRWM welcomes the Government's renewed efforts in 2009 to communicate with local government, stakeholder groups at nuclear sites, Regional Development Agencies and others about geological disposal whilst at the same time working positively with the authorities in West Cumbria who have already expressed an interest in the possibility of hosting a GDF.

7. CoRWM considers greater effort is likely to be needed to inform and support local authorities, particularly in non-nuclear areas.

8. Some local authorities, including some of those that have made an Expression of Interest, have expressed concerns to CoRWM about what would happen if the

present voluntarism approach to site selection failed. They think it is possible that, if they exercised their right to withdraw some way into the site selection process, sufficient work may have been undertaken in their area for Government to select it if the present process failed and a non-voluntary approach were adopted. CoRWM considers that it would contribute to the confidence that local stakeholders have in the current site selection process if Government were to restate its commitment to the voluntarism approach and to indicate that it would consult stakeholders before adopting any other approach.

Managing the Implementation of Storage and Geological Disposal

Decision Making

9. CoRWM considers that, because most of the decision-making arrangements for implementation of geological disposal have been in place for less than a year, it would be premature for it to express any views on their overall adequacy or efficiency. However, CoRWM notes that there is a lack of clarity on two aspects of decision making at the local level.

10. One aspect was to some extent foreseen in the MRWS White Paper and concerns which local authority (or authorities) should be the Decision Making Body (or Bodies) in situations where there is more than one tier of local government. It has become apparent that Government advice may be required in such situations. CoRWM encourages Government to provide such advice in a timely way.

11. The other aspect of local decision-making where there is currently a lack of clarity is in the identification of potential sites and, therefore, potential host communities, after a Decision Making Body has made a Decision to Participate. It is CoRWM's view that potential sites should only be considered for surface-based investigations where there is credible support in the potential host community. Such support may not be forthcoming unless communities have a clear understanding of how potential sites will be identified and CoRWM therefore encourages Government to provide the necessary clarity.

Funding

12. The issue of funding is important to a range of stakeholders and to the wider public. CoRWM's consideration of NDA funding for implementation of geological disposal showed that the main need in the immediate future is for Government and the NDA to consider and explain more fully the mechanisms by which funding will be made available during the various stages of the implementation of geological disposal. It is essential that the issue of intergenerational equity is taken into account.

13. CoRWM notes that Government is committed to funding Engagement Packages for communities that have expressed an interest in entering discussions on hosting a geological disposal facility. In Cumbria, the Government has already provided some financial support to the West Cumbria MRWS Partnership. It is important that the formal Government agreements with local authorities to fund Engagement Packages give confidence to communities that sufficient funds will be available for as long as they are required.

14. CoRWM considers that Government should begin work to develop the principles that will be used in developing Community Benefits Packages. Based on CoRWM's previous work, it expects these principles to include:

- The package will aim to enhance the wellbeing of areas on which the disposal facility will have a significant impact in both the short and longer term in recognition that they are enabling a national need to be met.
- The package will reflect the future development aspirations of areas.

15. Government will also need to set out clearly the process by which the Package will be delivered.

RECOMMENDATION 1
CoRWM recommends to Government that it begins work now to develop the principles to be used in deriving Community Benefits Packages and the process by which Packages would be agreed. This should include work on providing confidence that, once agreed, such Packages will be delivered.

Management of Risks

16. CoRWM welcomes the establishment by the NDA and Government of risk management frameworks and risk registers and will monitor how these operate in practice.

17. CoRWM looks to local government to develop a risk-based approach to those aspects of implementing geological disposal in which it has a role.

International Experience

18. CoRWM considers that important lessons are available from overseas experience and is pleased that the NDA and UK regulators are gaining knowledge from their international counterparts. It is desirable that Siting Partnerships should also be able to benefit from overseas experience, both directly and *via* the NDA and the regulators.

Public and Stakeholder Engagement

19. The White Paper acknowledges the importance of public and stakeholder engagement in the geological disposal facility site selection process and identifies the NDA framework for public and stakeholder engagement and communication as a key element.

20. When the White Paper was published, Government set up a dedicated website to provide information and indicated a willingness to respond to any approach for information from a community. It responded to a number of approaches and met with communities when asked to do so. It now regularly attends meetings of the West Cumbria MRWS Partnership. It has also commenced a new initiative for raising the profile of the siting process for geological disposal.

21. In the case of NDA, CoRWM is concerned that the PSE and communications work of its Radioactive Waste Management Directorate (RWMD) is not yet

sufficiently integrated within the overall NDA family. CoRWM thinks that RWMD should work more closely with the rest of the NDA to produce an overall PSE and communications strategy that will take account of the fact that the RWMD will, in due course, become the site licence company that will be the delivery organisation for geological disposal.

22. CoRWM itself undertook PSE in the preparation of this report. A consultation draft was placed on the website and copies were sent to a number of stakeholders. Bilateral meetings were held with NuLeAF and the NDA whilst a stakeholder workshop was held in Cumbria to discuss the draft report.

Regulation and Permitting

The Regulators – the Regulatory Framework

23. CoRWM welcomes the moves towards setting up a joint regulators' team and office for geological disposal. It also welcomes the revised Environment Agency guidance on geological disposal (the GRA).

24. CoRWM is pleased that steps are being taken to make the legislative changes needed to allow staged authorisation of a geological disposal facility under the provisions of the Radioactive Substances Act 1993 and to allow geological disposal facilities to be licensed as such under the Nuclear Installations Act 1965. These changes will provide greater clarity to potential host communities about the regulatory framework for geological disposal.

Land Use Planning

25. The new provisions contained in the Planning Act 2008 and the possible change of attitude regarding whether one or more planning applications will be appropriate to deliver a GDF are creating some uncertainty amongst community representatives.

RECOMMENDATION 2
CoRWM recommends to Government that it should explain how local stakeholders would have an opportunity to influence the outcome of the planning application process for a GDF if the application is referred to the Infrastructure Planning Commission.

RECOMMENDATION 3
CoRWM recommends to Government that the NDA and the Government should discuss with communities that have expressed an interest, the advantages and disadvantages of single- and two-stage planning applications for underground investigations and construction of a GDF. In particular, the discussions should cover the hold points, that could be subject to conditions attached to approval of a single application, and opportunities for local stakeholder engagement at such hold points.

26. CoRWM considers that the proposed NDA Framework for Sustainability Appraisal and Environmental Assessment for Geological Disposal meets current requirements for SEA, SA and EIA and that principles of good practice have been incorporated.

27. CoRWM welcomes the fact that SEA, SA and EIA will be utilised at all stages (both at strategic and local levels) of the implementation of geological disposal to inform key decisions. CoRWM also welcomes the proposals for extensive consultation with stakeholders and the public, peer review of all assessments and the establishment of an independent Advisory Group.

Inventory of Radioactive Waste

28. Previously, CoRWM recommended that the NDA (with DECC) produce a "Future Scenarios" paper that would provide an overview of what wastes might be placed over time into a GDF. This would be complementary to the information in the UK Radioactive Waste Inventory. CoRWM welcomes the positive response given to this suggestion.

Development of Geological Disposal Concepts and Facility Designs

29. CoRWM welcomes NDA work on its Provisional Implementation Plan (PIP) for geological disposal and its Disposal System Safety Case (DSSC). CoRWM notes that NDA is producing a shorter, more accessible, report on "planning for Geological Disposal" and an overview report on its generic DSSC. The Committee is pleased that both of these will be in the public domain.

30. There are two stages in designing for geological disposal: concept development and facility design development. CoRWM considers that option assessments are essential at both stages.

31. The NDA is currently at the concept development stage. CoRWM is of the view that, in option assessments at the concept level, it is important to consider a wide range of options. These should include disposal in facilities constructed using various techniques, at depths ranging from about 200m to more than 1km, disposal of all higher activity wastes in a single facility, separate facilities for various types of higher activity wastes, and facilities incorporating differing degrees of retrievability. In identifying the concepts to be assessed, the NDA should take full account of recent advances in engineering and mining technologies. The NDA should keep up to date with developments relevant to deep borehole disposal and reassess the viability and potential costs of this concept at intervals. This will enable deep borehole disposal to be considered for particular types of higher activity wastes if an alternative to other concepts is required.

32. In preparation for the design level options assessments, it is necessary to have in place an integrated process of GDF design, site assessment and safety case development. This will enable designs for each candidate site to be evaluated and compared.

33. CoRWM believes that a wide range of stakeholders should be involved in option assessments, at both concept and facility design level.

RECOMMENDATION 4
CoRWM recommends to Government that it should ensure that the NDA carries out option assessments in which a wide range of geological disposal concepts is considered. These should include disposal in facilities constructed using various techniques, at depths ranging from about 200m to more than 1km, disposal of all higher activity wastes in a single facility, separate facilities for various types of higher activity wastes, and facilities incorporating different degrees of retrievability. A wide range of stakeholders should be involved in these assessments.

RECOMMENDATION 5
CoRWM recommends to Government that it should ensure that the NDA has an integrated process in place for geological disposal facility design, site assessments and safety case development. The process should be described in publicly available documents that have been reviewed by independent experts and the regulators.

Screening out Unsuitable Areas

34. CoRWM welcomes the Government's commitment that the draft BGS report on site screening will be made available to stakeholders and public in the relevant area as well as being subject to peer review.

Desk-Based Studies

35. NDA is committed to a consultation on the proposals for Stage 4 of the site selection process and on how this will be implemented within a framework of sustainability appraisal and strategic environmental assessment (SA/SEA).

36. CoRWM considers it advantageous for time to be allowed in this process for potential host communities, having expressed an interest, to participate in the consultation and for their inputs to be taken into account in developing the proposals before they are put to Government for agreement.

Progress So Far

37. CoRWM welcomes the progress made by Government and the NDA in carrying forward the geological disposal implementation programme set out in the June 2008 White Paper.

1 INTRODUCTION

Scope of Report

1.1 CoRWM's remit is to provide independent scrutiny and advice to Government on the long term management of higher activity radioactive wastes and materials that may be declared to be wastes. This report describes the results of CoRWM's work in 2008-09 on progress with the implementation of geological disposal through the Managing Radioactive Waste Safely (MRWS) programme as set out in the 2008 White Paper (Defra *et al.,* 2008). It covers a number of tasks in CoRWM's work programme for 2008-09 (CoRWM doc. 2266). These tasks can be grouped into six main areas (see Box 1) with a more detailed breakdown given in Annex D of the Programme of Work 2008-2011 (CoRWM doc. 2266).

Box 1 Main Areas of CoRWM Scrutiny

- The voluntarism and partnership process for geological disposal site selection
- Managing the implementation of geological disposal
- Regulation
- The waste and materials to be managed
- Developing geological disposal concepts and facility designs
- Assessing possible disposal sites

1.2 This report is mainly about geological disposal of existing and committed higher activity wastes. CoRWM will be considering new build wastes in detail as part of its 2009-10 work programme.

Context

1.3 In 2006, CoRWM made recommendations which can be summarised as identifying geological disposal as the preferred long-term management option at the present time for higher activity wastes, coupled with the provision of safe and secure interim storage together with an intensified programme of research and development (R&D) to support both disposal and interim storage (CoRWM doc. 700). It further recommended a site selection process based on the willingness of communities to participate. Issues associated with the provision of interim storage and R&D are addressed in the two other reports produced by CoRWM in 2009 and are not addressed further here (CoRWM docs. 2500, 2543).

1.4 The UK Government and the Devolved Administrations accepted most of CoRWM's recommendations and gave the responsibility for delivering geological disposal to the Nuclear Decommissioning Authority (NDA) (UK Government *et al*., 2006). Following a public consultation in 2007, the UK Government, in conjunction with the Welsh Assembly Government (WAG) and the Department of the Environment Northern Ireland (DoENI), produced a White Paper in June 2008 that described its framework for implementing geological disposal (Defra *et al*., 2008). The Scottish Government declined to support a policy of geological disposal and it did not put its name to the White Paper, whilst the Welsh Assembly Government decided to reserve its position on whether or not to support the development of a facility in Wales.

1.5 The essence of the White Paper was to set out the UK Government's framework for implementing geological disposal of higher activity radioactive waste. It was accompanied by an invitation for communities to express an interest in opening up without-commitment discussions with Government on the possibility of hosting a geological disposal facility (GDF) at some time in the future. This represented a change of approach to site selection from that employed previously and unsuccessfully in the UK.

1.6 The NDA plans that its Radioactive Waste Management Directorate (RWMD) will evolve into the delivery organisation that would develop and ultimately construct a GDF.

1.7 Governance arrangements for the NDA have been revised to cover its responsibilities for geological disposal.

Approach to the Work

1.8 The work described in this report has focused on those aspects of the implementation of geological disposal that CoRWM considers to be crucial in establishing confidence in potential host communities and in ensuring the technical robustness of the site selection process, the GDF design process and the development of the disposal system safety case.

1.9 The general approach for each of the topics listed in Box 1 was to gather information from meetings with the relevant organisations and to use this to produce a paper that was discussed at one of CoRWM's plenary meetings. The outcome of those discussions, any updated information and any advice that was developed is contained in this report.

1.10 In terms of learning from international experience, CoRWM produced a report of the information that had been compiled and analysed over the last three years (CoRWM doc. 2213.1). Members have also attended the UK meetings of the European Commission research project, COWAM (Community Waste Management) in Practice (CIP) (www.cowam.com). This programme is identifying good practice in the governance of long-term management of radioactive waste. Members have also discussed the potential lessons to be learnt with leading researchers in the CIP work (CoRWM doc. 2530). Members of the Committee visited sites in Finland and Sweden in March 2008 and had the opportunity to discuss matters with Government officials, regulators, NGOs and representatives of local communities in both countries.

Layout of the Report

1.11 The following sections address each of the topics that are listed in Box 1 in paragraph 1.1. The conclusions and recommendations are set out in Section 15.

2 VOLUNTARISM AND PARTNERSHIP IN THE GEOLOGICAL DISPOSAL SITING PROCESS

The White Paper 2008

2.1 CoRWM reviewed the White Paper (Defra *et al*., 2008: Cm 7386) to assist in shaping the future work programme and to highlight any issues that CoRWM might wish to raise with Government as part of its ongoing advice.

2.2 The conclusions of the review are reported in CoRWM document 2431. The major points considered are as follows.

Timing and Provision of Information

2.3 It is apparent that communities and their representatives need a background knowledge and understanding of what is entailed in order to be able to express an interest in the possibility of hosting a GDF. Thus, the provision of trustworthy information is important, particularly to non-nuclear communities and it is expected that expressing interest will take longer in a non-nuclear community than one which is familiar with nuclear issues. Government therefore stated that the opportunity to express an interest would be left open for the foreseeable future (Defra *et al*., 2008, Para 8.3).

2.4 Government has established a dedicated website to provide information on both process and technical issues associated with implementing a GDF and has expressed a willingness to respond to any approach for information from a community. Government has addressed local authorities, including parish and community councils, on request and, where requested, has been accompanied by specialists such as members of the British Geological Survey.

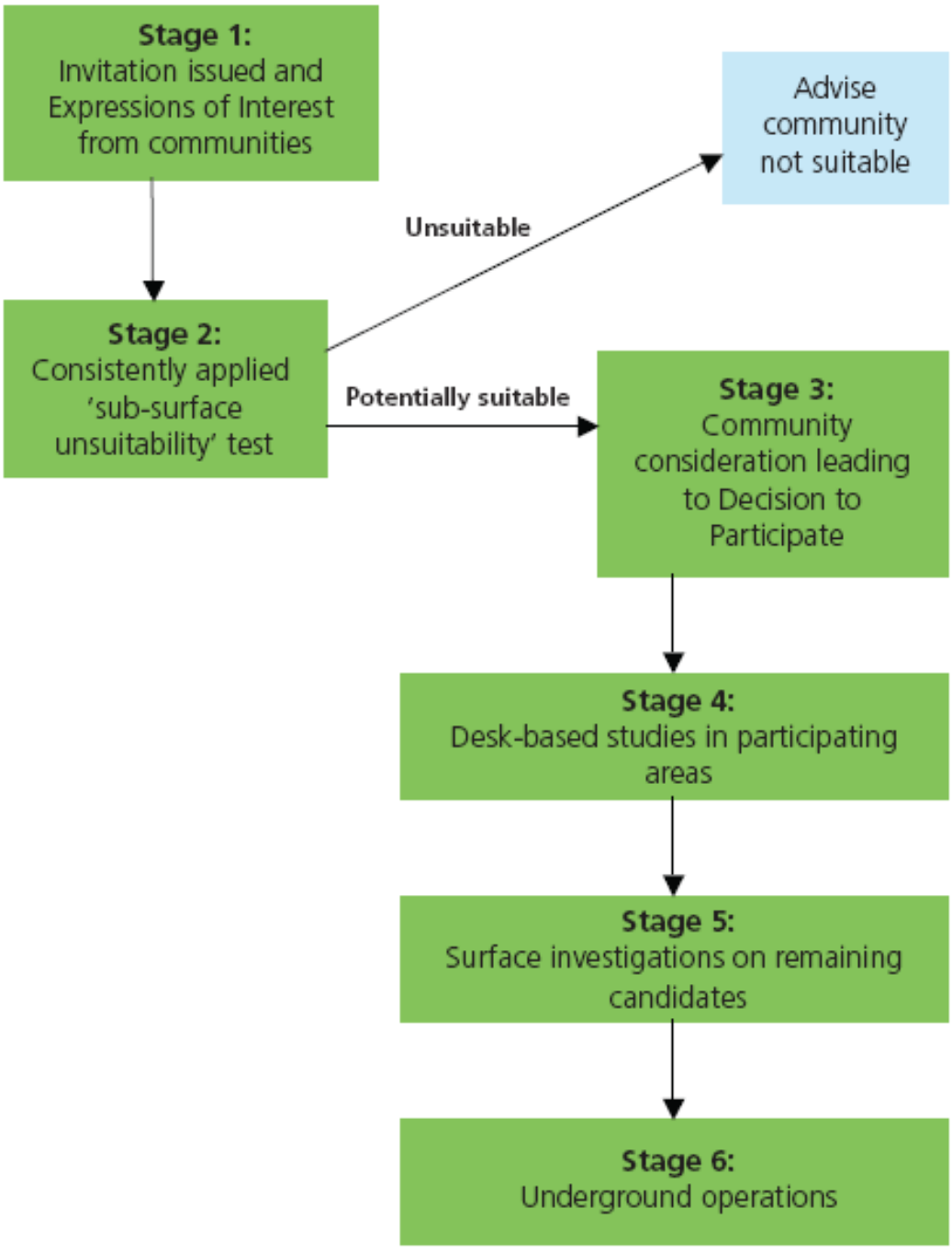
2.5 The stages in the site selection process as set out in the White Paper are reproduced in Figure 1.

Dealing with Uncertainties

2.6 An essential aspect of inspiring the confidence of stakeholders in geological disposal is demonstrating that the uncertainties in how the facility will perform are properly identified and that the R&D that is required to address them has been identified and will be commissioned. This aspect will be considered in CoRWM's report on R&D (CoRWM doc. 2543). It is important to recognise that, while research may reduce uncertainties, this is not always the outcome. In some instances, research will only improve the quantification of uncertainties; in others, it may reveal previously unknown uncertainties.

2.7 A summary and analysis of the responses to the White Paper has been published which presents the range of views submitted. CoRWM is aware that further useful information exists and it would be good practice in future, in similar circumstances, for such material also to be publicly available.

Figure 1: Stages in the Site Selection Process



Source: Defra *et al.*, 2008

How Many Geological Disposal Facilities?

2.8 The Government's stated preference is for a single geological disposal facility (GDF) if that proves to be technically achievable at the sites to be considered. There are concerns amongst some specialists that this may not be the most appropriate option. These concerns are acknowledged in the White Paper where paragraph 4.25 states that "in principle the UK Government sees no case for having separate facilities if one facility can be developed to provide suitable, safe containment for the Baseline Inventory...There is no reason why this should not be technically possible, in theory, although the final decision would be made in the light of the latest technical and scientific information, international best practice and site specific environmental, safety and security assessments."

2.9 CoRWM's consideration of the number of facilities is set out in Section 12.

Concern about Imposition

2.10 The White Paper at paragraph 6.5 states that "in the event that at some point in the future, voluntarism and partnership does not look likely to work Government reserves the right to explore other approaches". Some local authorities, including some of those that have made an Expression of Interest, have expressed concerns to CoRWM about what would happen if the present voluntarism approach to site selection failed. They think it is possible that, if they exercised their right to withdraw, sufficient work might have been undertaken in their area for Government to select it if the present process failed and a non-voluntary approach were adopted (CoRWM doc. 2468).

2.11 CoRWM considers that it would be helpful if Government were to restate its commitment to the voluntarism approach and to indicate that it would consult stakeholders before adopting any other approach.

The Invitation to Communities to Express an Interest

2.12 Following publication of the MRWS White Paper, it was important for CoRWM to establish what mechanisms were used to make local communities aware of the document and, in particular, to provide them with the opportunity to express an interest in discussing with Government the possibility of hosting a GDF.

2.13 Defra wrote to every local authority chief executive in England and issued a press release. A Parliamentary Statement was also issued. The Welsh Assembly Government also wrote out and issued a press release. No date was given as to when Expressions of Interest had to come forward. To go further and explicitly target a single or small number of authorities was considered likely to place undue pressure on a community.

2.14 The Nuclear Legacy Advisory Forum (NuLeAF), on behalf of the Local Government Association, issued a press release and circulated it to all local authorities in England and Wales, not just NuLeAF members, drawing attention to the White Paper and the invitation to express an interest. As far as CoRWM is aware, there was no equivalent publicity within local government circles in Scotland or Northern Ireland.

2.15 There was significant reporting, not all favourable, in the national and, to a much lesser extent, in the professional press immediately after the White Paper was issued but almost none since.

2.16 The Chair of CoRWM also wrote to every local authority chief executive in the UK inviting them to advise CoRWM on what action their authority might take in response to the invitation to express an interest. The letter was phrased neutrally since what CoRWM was interested to learn was the extent of discussion, if any, of the White Paper.

Responses to the Invitation

2.17 At the time of writing this report, Expressions of Interest have been made by Copeland and Allerdale Borough Councils in opening discussions with Government without commitment on the possibility of their being potential host communities for a GDF. In addition, Cumbria County Council has made an Expression of Interest in opening discussions with Government on Copeland or Allerdale being potential host communities. Government has also received 13 responses from Councils that have decided not to make an Expression of Interest or that had wider comment on the White Paper.

The Siting Process so far

2.18 CoRWM sought to form a judgment on the success of a process so far unique in the UK of asking communities, whether with a nuclear history or none, to volunteer to be considered to host a facility for the disposal of higher activity wastes. This was done from the responses received to the Chair's letter, from meetings with NuLeAF (*e.g.* CoRWM docs. 2385, 2511), Councils with nuclear sites in Wales (CoRWM docs. 2432, 2504) and the Convention of Scottish Local Authorities (CoSLA) (CoRWM doc. 2333), from information gleaned from press reports and from a selective view of local authority websites.

2.19 CoRWM questions whether the low key approach adopted in and following publication of the White Paper reached the target audience, principally local authorities but also parish and community councils as well as landowners.

2.20 Whilst the process is at an early stage, it is disappointing that no Expressions of Interest have been forthcoming other than in Cumbria.

2.21 Concerns have been expressed (CoRWM doc. 2333) about the absence of a cut-off date for Expressions of Interest. The Committee considers it is not appropriate to specify such a date at this stage in the site selection process.

2.22 CoRWM has evidence that the chief executives of some local authorities did not consider there was any merit in their authority giving consideration to making an Expression of Interest (CoRWM doc. 2446.1). This decision, in the main, appears to have been taken without reference to elected members or only following discussion with one or two senior members. There is almost no evidence of Council Cabinets, Committees or full Councils receiving a written report and thus being given the opportunity to discuss the White Paper. Such an absence of discussion in a public forum meant that there was no reporting of the issue in the

local media resulting in the wider public being unaware of the potential economic, environmental and social impacts of hosting a geological disposal facility.

2.23 The apparent lack of knowledge about the existence of the White Paper amongst councillors either holding senior positions in the Administration of their Council or holding the portfolio on nuclear matters in Councils which already have nuclear facilities currently being decommissioned is of particular concern.

2.24 The Geological Society of London convened a meeting in London on 24 October 2008 with a view to wider dissemination and discussion of the issues but unfortunately attendees were mainly those already aware of the White Paper.

2.25 CoRWM is aware of two "non-nuclear" authorities which considered but rejected making an Expression of Interest; one following a discussion at an Executive meeting which was then reported in the press.

2.26 CoRWM concluded in January 2009 that, relative to the overall timescale for delivering one or more facilities for the disposal of higher activity waste, there was still time for Government to make renewed efforts to extend the debate which might bring about further volunteer communities.

2.27 CoRWM welcomes the Government's intention to communicate further with local government (although CoRWM does not necessarily think it appropriate or necessary to approach every local authority), NDA stakeholder groups, regional development agencies and others, beginning in the second quarter of 2009. At the same time, it is important that Government continues to work positively with those authorities in West Cumbria who have already made Expressions of Interest in discussing with Government the possibility of hosting a GDF. It cannot be assumed that any Expression of Interest will lead to a Decision to Participate (Stage 3 in Figure 1).

2.28 CoRWM welcomes the Government's publication of fact sheets on aspects of the MRWS programme. It encourages Government and the NDA to produce similar documents in order to assist lay participants throughout the GDF siting process.

3 DECISION MAKING

3.1 CoRWM's understanding of the decision-making processes in the implementation of geological disposal is described in a paper produced in March 2009 (CoRWM doc. 2558). This summarises the roles and responsibilities of the main organisations involved at national level and at the level local to potential sites for a geological disposal facility.

3.2 At national level, the Government takes policy decisions related to geological disposal and exercises governance over the NDA. All the major policy decisions are taken by Ministers, as are all the major decisions related to NDA strategy and funding.

3.3 Government has two groups that assist it in decision-making for geological disposal: the Geological Disposal Implementation Board and the Waste Management Steering Group. Each group is chaired by an official from the Department of Energy and Climate Change (DECC).

3.4 The Geological Disposal Implementation Board (GDIB) manages the Government and NDA arrangements for planning and delivery of a geological disposal facility as set out in the White Paper (Defra *et al.*, 2008). Its role includes the provision of advice to Ministers and the preparation and publication of Government decision documents. The organisations that are represented on the GDIB are: DECC, the Welsh Assembly Government (also representing the interests of the Northern Ireland Assembly Government), the Treasury and the NDA (as the Government's delivery body). A member of CoRWM attends selected meetings of the GDIB as an observer, to obtain information relevant to CoRWM's scrutiny role.

3.5 The Waste Management Steering Group (WMSG) was established in 2007 to augment previous governance arrangements for the NDA. It scrutinises all of the NDA's long-term waste management planning and development programmes, taking a holistic approach to radioactive waste management on all issues associated with the long-term management of radioactive waste. This includes implementation of Government policy on geological disposal of intermediate and high level wastes, alongside wider waste issues such as national strategy for the management of low level radioactive waste. The WMSG has members from DECC, the Treasury, the Scottish Government, the Department of Environment Northern Ireland and the NDA. A member of CoRWM attends selected meetings of the WMSG as an observer, to obtain information relevant to CoRWM's scrutiny role.

3.6 At local level, key decisions will be taken by the relevant "Decision Making Body" within local government (Defra *et al*., 2008). After an initial Expression of Interest in entering without-commitment discussions about siting of a geological disposal facility, the key decisions at local level are (Defra *et al*., 2008):

- the Decision to Participate, that is the making of a formal commitment to participate in the siting process, but without any commitment to eventually host a geological disposal facility

- at various stages whether to continue participation in the process, or exercise a Right of Withdrawal
- about the local acceptability of a Community Benefits Package
- about the local acceptability of sites that are proposed for surface-based investigations (*e.g.* seismic studies, borehole investigations)
- whether potential retrievability of wastes has been adequately considered.

3.7 Each area is expected to set up a formal Community Siting Partnership to enable the potential host community, the Decision Making Body (or Bodies if there is more than one) and nearby communities (called "wider local interests" in the White Paper) to work with the NDA and other relevant parties. The NDA will not be involved in decisions on community-related issues (Defra *et al*., 2008).

3.8 Ministers will take the final decisions on the sites for surface-based investigations, the site for underground investigation and facility construction and on Community Benefits Packages (CoRWM doc. 2558; Defra *et al*., 2008).

3.9 There will be regulatory decisions at various stages in the implementation of geological disposal (EA and NIEA, 2009). It is expected that the Environment Agency (EA) will issue environmental permits for intrusive surface-based investigations, underground investigations and initial construction, commissioning of the facility, the start of disposal, other key stages in disposal operations and, eventually, closure of the facility. The Nuclear Installations Inspectorate (NII) is expected to issue a nuclear site licence before the start of underground investigations and construction, and to regulate thereafter *via* licence instruments. Sometime after closure the facility will be delicensed and the environmental permit will be surrendered (EA and NIEA, 2009).

3.10 The NDA will be required to make a planning application for borehole investigations. Planning permission will need to be granted before the EA will issue the first environmental permit (EA and NIEA, 2009).

3.11 Underground work will require planning permission. The White Paper states that the NDA is exploring whether a single planning application covering underground-based investigations and the construction of a disposal facility could be possible. This depends in part on whether sufficient information can be obtained from surfaced-based investigations, which will not be known until site data are available. If sufficient information cannot be obtained from surface-based investigations, then it may be necessary to consider separate planning applications for underground-based investigations and facility construction (Defra *et al*., 2008). Advice from the EA and the NII will be important inputs to the planning decision, which would be made before an environmental permit for underground work is granted (EA and NIEA, 2009).

3.12 CoRWM considers that, because most of the decision-making arrangements for implementation of geological disposal have been in place for less than a year, it would be premature for it to express any views on their overall adequacy or efficiency (CoRWM doc. 2558). However, CoRWM notes that there is a lack of clarity in two aspects of decision making at local level (CoRWM docs 2593, 2604, 2605).

3.13 One aspect was to some extent foreseen in the MRWS White Paper (Defra *et al*., 2008) and concerns which local authority (or authorities) should be the Decision Making Body (or Bodies) in situations where there is more than one tier of local government. The Decision Making Body (or Bodies) must be identified before a Decision to Participate can be made.

3.14 The White Paper states that Government's intention is to provide flexibility about Decision Making Bodies to account for local circumstances and to allow communities to have a degree of self-definition (para 6.7, Defra *et al*., 2008). In CoRWM's view, it is important that the question of which local authority is to be the Decision Making Body (or whether several local authorities work together in a single Decision Making Body) is resolved at local level. However, it has become apparent that Government advice may be required, for example on the issue of the extent to which a County Council could delegate responsibility to District Councils (CoRWM docs. 2593, 2604, 2605). CoRWM encourages Government to provide advice in a timely way so that local decision making is not delayed.

3.15 The other aspect of local decision-making where there is currently a lack of clarity is in the identification of potential sites and, therefore, potential host communities, after a Decision Making Body has made a Decision to Participate. At this time, there may be a substantial area that has not been screened out by applying the Sub-Surface Exclusion Criteria (Section 13) and there will be a need to identify potential sites for surface investigations. This will involve both technical and socio-political considerations. A complication is that the areal extent ('footprint') of a GDF will depend on the local geology and this cannot be confirmed until site investigations and the design of the disposal facility have reached a reasonably advanced stage.

3.16 It is CoRWM's view that potential sites should only be considered for surface-based investigations where there is credible support (para 6.22, Defra *et al*., 2008) in the potential host community. When there is agreement on who the potential host communities are, CoRWM would expect them to have direct representation on the Siting Partnership. It will be difficult for local stakeholders to give their support without a clear understanding of how potential sites will be identified (CoRWM docs. 2593, 2604, 2605).

3.17 CoRWM will continue to scrutinise the decision-making process.

4 FUNDING

4.1 The issue of funding is important to a range of stakeholders and to the wider public. People in areas that have expressed an interest in hosting a geological disposal facility, or who might be considering doing so, will want to be reassured that there will be secure and adequate funding to support Engagement and Community Benefits Packages. They will also want to be assured that there will be adequate and secure long-term funding to ensure that a GDF, once embarked on, will be taken through to completion (CoRWM docs. 2488, 2453). Funding is also important to the supply chain that will be involved in the development and implementation of a GDF (Live Group, 2009).

4.2 CoRWM considered funding issues in the first half of 2008-09 (CoRWM doc. 2426). Its starting point was that there is a need to ensure:

a. the adequacy and security of funding for geological disposal
b. the adequacy and security of funding for local engagement
c. the adequacy and security of funding for community benefit packages
d. that funding mechanisms and flows are used efficiently and effectively to achieve value for money whilst helping maintain and enhance safety and security
e. that the requirements of intergenerational equity are taken into account.

Funding for Geological Disposal

4.3 The NDA is the implementing body for geological disposal. CoRWM therefore needed to consider whether NDA funding mechanisms for geological disposal are appropriate to provide confidence that it will be delivered efficiently and cost-effectively.

4.4 Geological disposal is a project that will extend over many decades, perhaps over a century or more. At present, the total undiscounted cost of a GDF is estimated by the NDA to be £13.8 billion, of which about £4 billion would be spent over the 30 years or so before any waste was emplaced. The annual costs of establishing and operating a GDF would vary from a few tens of millions of pounds to a peak of about £200 million (NDA, 2008).

4.5 The current UK public spending planning process involves Comprehensive Spending Reviews (CSRs), which are carried out every three years.

4.6 The contrast between the long-term nature of geological disposal and the short-term nature of the public spending reviews is a cause of concern to stakeholders (CoRWM doc. 2593).

4.7 Given these concerns, CoRWM believes there is a need for Government and NDA to consider and explain more fully how they will ensure that appropriate funding will be available during the various phases of the implementation of geological disposal. It is essential that intergenerational equity is taken into account.

4.8 It is noted that funding for the regulation of radioactive waste management comes mainly from the waste producers, through cost-recovery schemes. The NDA currently has a range of agreements to facilitate cost recovery by regulators for their scrutiny of and engagement with the geological disposal programme. These agreements will change and be superseded as geological disposal progresses. However, it is envisaged that the regulators will always be able to recover their costs, either directly from the NDA or from the SLC that is delivering geological disposal. Thus, assuring NDA funding assures funding for the regulators for their regulation of geological disposal.

Engagement Packages

4.9 The White Paper states that the costs of local community engagement will be funded, either partly or wholly, through Government. It also states that "what support, and the point at which it is available will be something to be considered in the scope of initial discussions following an Expression of Interest" (para 6.48, Defra *et al*., 2008). The costs of setting up and operating a Community Siting Partnership will also be supported through the Engagement Package (para 6.49, Defra *et al*., 2008).

4.10 In its 2007 report, "Implementing a Partnership Approach", CoRWM recommended that the Government should fund engagement activities and, in particular, should fund community partnerships as soon as they were established and throughout their existence. It also recommended that, whatever mechanism was chosen, there needed to be a secure basis for funding over time (paras 307-309, CoRWM doc. 2146).

4.11 CoRWM considers that the White Paper, and Government actions with respect to Cumbria, show that the Government is committed to funding Engagement Packages. However, some parish councils and their associations in Cumbria have expressed to CoRWM their concern that it is not yet clear how their on-going engagement costs will be covered (CoRWM doc. 2593).

4.12 It is too early to judge whether the level of funding in any area that expresses an interest will be sufficient to meet the needs of the local community. In Cumbria, the Government has already provided financial support to the West Cumbria MRWS Partnership. CoRWM also notes that funding for Engagement Packages will come from the budget of the relevant government department (DECC for sites in England) and will be subject to the same public spending planning process as the NDA's funding (para 4.5). In CoRWM's view, it is important that the formal Government agreements with local authorities to fund Engagement Packages give confidence to local communities that sufficient funds will be forthcoming for as long as they are required.

Community Benefits Packages

4.13 The White Paper refers to community benefits through incoming jobs and infrastructure directly associated with the GDF development (paras 6.54-6.55, Defra *et al*., 2008). It is CoRWM's view that, as is recognised in the White Paper, local communities are likely to be looking for something over and above this. They will need to have confidence that an adequate Benefits Package will be forthcoming, especially given the statement in para 6.57 of the White Paper that

there "**may** be other benefits which **may** be commensurate with developing the social and economic wellbeing of a community that has decided to fulfil such an essential service to the nation" [*emphasis added*]. References to subjective terms such as "affordable" and "value for money considerations" (para 6.60) have caused people to question whether their requirements will be met by Government's understanding of what is affordable or value for money.

4.14 CoRWM considers that Government should begin work to develop the principles that will be used in developing benefits packages. Based on CoRWM's previous work (CoRWM Doc. 700, CoRWM's April, 2007 Report), it expects these principles to include:

- The package will aim to enhance the wellbeing of areas on which the disposal facility will have a significant impact in both the short and longer term in recognition that they are enabling a national need to be met.
- The package will reflect the aspirations of areas for their development in the future.

4.15 Government will also need to set out clearly the process by which the Package will be delivered.

5 MANAGING RISKS

5.1 It is important in establishing stakeholder confidence to ensure that the risks associated with managing radioactive wastes, in general, and implementing geological disposal, in particular, are being identified and managed. All projects have inherent risks. The key to success is identifying them sufficiently early so that they can be managed. In this respect, the two key organisations are the NDA and Government but there are also risks for local government.

NDA

5.2 The published note of the meeting with the NDA on 30 July 2008 with the document it refers to, sets out a description of the NDA's risk management framework in general and how it is approaching geological disposal in particular (CoRWM doc. 2412). This describes a comprehensive, integrated, framework. The NDA's 2007-2008 Annual Report states that the Office of Government Commerce has recognised the NDA's internal risk management framework as probably the best in the public sector (NDA, 2008).

5.3 In terms of how the risk framework works in practice, the 2007-2008 NDA Accounts, the Statement of Internal Control and the National Audit Office 2008 Report on the NDA identify a number of areas for improvement (NAO, 2008; NDA 2008a). However, the external auditor for the NDA (the National Audit Office) gives a clear opinion on the accounts with no qualifications: though there is a note on the continuing uncertainty regarding the scale of likely costs of the nuclear liabilities.

5.4 The NDA is identifying risks and has developed a register of risks and opportunities for the development of a GDF. There are commitments to learning from overseas and to capturing stakeholders' views of risk. The NDA has allowed members of CoRWM to examine this register of risks and opportunities, though it is not accessible to the public.

5.5 CoRWM welcomes the establishment by the NDA of risk management frameworks and risk registers.

Government

5.6 The newly formed Geological Disposal Implementation Board (GDIB) (see Section 3) is developing a risk register. CoRWM has been advised that it will be able to access this although there has not yet been an opportunity to do so.

Local Government

5.7 There are several risks for local government associated with the stages of expressing an interest in discussing with Government the possibility of hosting a GDF, thereafter in making a decision to participate and finally if a site is identified in its area. CoRWM looks to local government to develop a risk-based approach to those aspects of geological disposal in which they have a role and recognises the intention of the current West Cumbria MRWS Partnership to develop principles, success criteria and risks for the Partnership's work.

5.8 CoRWM will be keeping a watching brief on how risks are being managed in practice by NDA, Government and local government. This will include examining how risk management procedures are being communicated to stakeholders and the public.

6 INTERNATIONAL EXPERIENCE

6.1 In June 2008, CoRWM published a report on its analysis of the developments in the long-term management of radioactive waste in several countries overseas (CoRWM doc. 2213.1). This report identified 16 lessons from this experience that are relevant to the implementation of geological disposal in the UK. Some of these had already been taken into account in Government's response to CoRWM's recommendations and the White Paper (Defra *et al.*, 2008). In its report, CoRWM identified the following areas of interest:

i. Ensuring that the process is not rushed and communities have the time they need to deliberate the issues and reach conclusions
ii. The funding arrangements for the Engagement Package[1]
iii. The funding arrangements for the Community Benefits Package[2] and how it should be negotiated
iv. The security of the funding arrangements for the surface-based investigations, an underground laboratory (if any) and the disposal facility itself
v. If there is more than one candidate community in the UK, who makes the decision on which site should be adopted. The Belgian experience indicates that it should not be the NDA
vi. The role that the regulators should play in the siting process and the review of the NDA's R&D programme.

6.2 In January 2009, CoRWM reviewed the ongoing implementation process in the light of overseas experience (CoRWM doc. 2534) and concluded the following:

- With respect to (i), there is no evidence that Government is rushing the process apart from the decision to issue the invitation to participate at the same time as publishing the White Paper. CoRWM had recommended an 18 month 'awareness raising period' between the two events (CoRWM doc. 2146).
- In the case of (ii) to (vi), CoRWM has recognised the importance of funding, clarity in decision-making and the role of the regulators in ensuring the confidence of stakeholders in the process. These issues will continue to form an important element of CoRWM's work.
- The report also draws attention to the work that is being undertaken in France to identify the governance and design requirements associated with the requirement under French law to provide retrievability for at least 100 years (Dumont *et al.,* 2008).

6.3 During discussions on risk management, the NDA explained to CoRWM how it is learning from experience in the USA (CoRWM doc. 2412). The Waste Isolation Pilot Plant (WIPP) in New Mexico is the only operational geological disposal facility for long lived, higher activity wastes. The NDA has had extensive contacts with the organisations that developed and operate WIPP; it has learnt about successes and failures at WIPP that can be used to inform its work in the UK. It is

[1] Called the "Involvement Package" in the CoRWM report.
[2] Called the "Community Package" in the CoRWM report.

also understood that NDA is building upon all the links established by Nirex with overseas waste management organisations, for example in Finland, France and Sweden. In addition, NDA participates in the European Commission COWAM in Practice project (*www.cowam.com*).

6.4 All the regulators (EA, SEPA, NII, OCNS and DfT) liaise extensively with their counterparts in other countries (CoRWM docs. 2406, 2414, 2436, 2464). Some of the contacts are bilateral whilst others are facilitated by organisations including the UN International Atomic Energy Agency, the Nuclear Energy Agency of OECD, the European Commission and the Western European Nuclear Regulators Association.

6.5 CoRWM considers that important lessons are available from overseas experience and is pleased that the NDA and UK regulators are in regular contact with their international counterparts. It is desirable that Siting Partnerships should also be able to benefit from overseas experience, both directly and *via* NDA and the regulators.

7 PUBLIC AND STAKEHOLDER ENGAGEMENT

7.1 CoRWM's work programme includes two types of public and stakeholder engagement (PSE) activities: the scrutiny of PSE undertaken by other bodies, and its own PSE activities undertaken in order to inform its advice to Government. In this report, the PSE work in relation to geological disposal is detailed; a summary of overall PSE activities is set out in the CoRWM Annual Report for 2008-09.

Scrutiny

7.2 CoRWM's work in preparing its 2006 recommendations and the responses to the Government consultation document in June 2007, prior to the publication of the 2008 MRWS White Paper, both present a convincing case for the importance of PSE in establishing confidence in the process for selecting a site for geological disposal. CoRWM, therefore, decided to include the scrutiny of the PSE activities of other bodies as part of its current work programme. In these early stages of the process, CoRWM has focussed on the ways in which the White Paper has been communicated to the public and stakeholders and on the arrangements that are being put in place by the NDA for public and stakeholder engagement.

7.3 The starting point in scrutinising PSE, to date, was to look at the plans set out in the White Paper, itself, and assess whether these were likely to be adequate. The next task was to scrutinise the way in which the plans had been implemented. CoRWM has carried out this work as follows:

- Compiling an overview of the responses to the consultation preceding the White Paper and of the Government summary documents on these responses
- Writing to local authorities
- Holding a number of bilateral meetings
- Attending meetings of other organisations
- Responding to the NDA consultation on PSE and SEA
- Convening a PSE event to discuss, amongst other things, geological disposal and CoRWM's PSE activities.

Government PSE

7.4 The White Paper acknowledges the importance of public and stakeholder engagement in the MRWS process and identifies the NDA framework for public and stakeholder engagement and communication as a key element.

7.5 Government has set up a dedicated website to provide information and has indicated a willingness to respond to any approach for information from a community. Government has provided regular support at the meetings of the West Cumbria MRWS Partnership.

7.6 As noted in Section 2, Government has commenced a new initiative for raising the profile of the siting process for geological disposal.

NDA PSE

7.7 The NDA issued a Consultation Document on a Public and Stakeholder Engagement and Communications Framework for Geological Disposal in 2008 and CoRWM members attended a workshop, convened by the NDA, to discuss these and related proposals on SEA. The full response to the PSE consultation is on the CoRWM website as CoRWM document 2479. The main points are summarised below.

7.8 CoRWM noted that the consultation document frequently refers to **the** geological disposal facility. Although Government has expressed a preference that there should be only one facility, it cannot be assumed at this early stage that this will be appropriate (Section 12). CoRWM recommended that, as far as possible, the NDA should refer simply to geological disposal in all its dealings with stakeholders.

7.9 CoRWM was concerned that the PSE and communications work of the RWMD is not sufficiently integrated within the overall NDA family and recommended that RWMD works more closely with the rest of the NDA to produce an overall PSE and communications strategy that will take account of the fact that the RWMD will, in due course, become a separate entity as an SLC.

7.10 CoRWM urged the NDA to consider carefully the role of PSE and/or communications in any particular situation and to draw up a protocol for determining its PSE and Communications in accordance with the criteria relating to the purpose of the activity in question.

7.11 CoRWM broadly agreed with the proposed objectives for the Strategy and welcomes the commitment to provide feedback to stakeholders. CoRWM agrees that the programme, as set out in the White Paper, cannot move forward unless there is public confidence and that gaining the confidence of the public and stakeholders must be one of the objectives of the Strategy.

7.12 CoRWM expressed concern that the "NDA plans to develop a local engagement plan in collaboration with the communities themselves" and questions whether there is any need for the NDA to be considering a lead role in developing local engagement plans at this time. During the time when the Community Siting Partnership is developing its recommendations, it is envisaged that interactions with the local community on implementing disposal will be with the partnerships. Any separate discussions with local government could be detrimental to the partnership process.

7.13 CoRWM agreed that it is essential to provide feedback on how inputs from stakeholders have been used. Two obvious consequences will follow if this is not done: (i) stakeholders will lose interest in engaging with the NDA because they will not see the point; and, more importantly (ii) stakeholders will lose confidence in the MRWS programme and the NDA's role within it.

7.14 The NDA's consultation document asked whether the NDA should set up arrangements to review the effectiveness of its public and stakeholder engagement and communications on geological disposal **in addition** to the work

of CoRWM. In response, CoRWM confirmed that scrutinising the NDA's work is one of its core functions but noted that it will not be possible for CoRWM to provide on-going quality assurance to the NDA on its PSE work. Instead, one of the aspects that CoRWM will comment on when reporting on its scrutiny of the NDA's PSE will be the extent to which the NDA has sought to assess the effectiveness of its PSE programme.

7.15 CoRWM stated that it would welcome the opportunity to comment on a further draft of the Framework prior to its submission to Government for final approval. A further meeting with the NDA was held on 10 March 2009 in which the NDA provided a brief summary overview of the changes it proposed to make. Unfortunately, it was not possible for the NDA to provide members with a final draft for comment in time for CoRWM to consider a detailed collective response. Instead, individual members offered comments.

CoRWM's PSE Activities

7.16 CoRWM, itself, has conducted one over-arching PSE event in Reading in October 2008. There were sessions on both geological disposal and the MRWS programme to date. Papers recording the comments made are available at CoRWM document 2488.

7.17 CoRWM has held a range of bilaterals throughout the last year with the NDA, regulators, plant operators, local government, NGOs: many have been referred to in this and the other reports to Government and all are subject to meeting notes which appear on the CoRWM website.

7.18 PSE activities were also conducted to provide an input to this report. A full draft of the report was published for comment by stakeholders and the public. The comments received and CoRWM's responses to them are available on our website (CoRWM doc. 2592).

7.19 Bilateral meetings about this report were held with NuLeAF (CoRWM doc. 2596) and NDA (CoRWM doc. 2599). A stakeholder workshop was held in Cumbria in May 2009 to discuss the draft report (CoRWM doc. 2593). All the key points made during the workshop have also been considered in finalising this report.

8 THE REGULATORS AND THE REGULATORY FRAMEWORK

Regulatory Coherence and Co-ordination

8.1 The regulators for geological disposal in England and Wales are:

- the Health and Safety Executive (HSE), including the Nuclear Installations Inspectorate (NII), the Office of Civil Nuclear Security (OCNS) and the UK Safeguards Office (UKSO), which are all within the Nuclear Directorate of HSE
- the Environment Agency (EA)
- the Department for Transport (DfT)
- Planning Authorities.

8.2 CoRWM carried out an assessment of the coherence of regulatory processes and coordination between the nuclear regulators in the implementation of geological disposal (CoRWM doc. 2420). The roles of the various regulators for each activity in the three phases of implementation of geological disposal were summarised and the needs for coherence and coordination were identified. It was concluded that existing mechanisms had a role to play but would not be sufficient. It was suggested that a joint regulators' team and office for geological disposal be set up (CoRWM doc. 2420).

8.3 In commenting on a draft of CoRWM doc. 2420, the regulators welcomed the idea of a joint office and stated that they already had work in progress to establish one along lines similar to those suggested. The Chair of CoRWM subsequently wrote to the EA, HSE and DfT encouraging them to set up a team and office as soon as was practicable. CoRWM learnt in June 2009 that EA, HSE and DfT had agreed in principle to set up a Joint Regulatory Office and that EA and HSE intended to establish a joint web page on geological disposal.

Legislative Changes

Provisions of the Radioactive Substances Act 1993

8.4 Government and the EA have agreed that the regulatory regime under the Radioactive Substances Act 1993 should be supplemented so as to provide for the authorisation of geological disposal facilities in several stages, rather than the single stage that would be used under the current law. The change to the regime will be effected by making regulations for England and Wales as part of phase 2 of the Environmental Permitting Programme (EPP2). There will be no corresponding legislative changes in Scotland or Northern Ireland. The consultation on the regulations began in February 2009 and ended in May 2009 (Defra, 2009). It is planned that the regulations will come into force in 2010. In CoRWM's view this change is essential. CoRWM is pleased that it is being addressed at this early stage because it will provide clarity for potential host communities about the regulatory framework for geological disposal.

Licensing of Disposal Facilities under the Nuclear Installations Act 1965

8.5 The HSE Board has agreed to a proposal to change the Nuclear Installations Regulations 1971 to make disposal a prescribed activity under the Nuclear

Installations Act. Such a change would mean that a geological disposal facility could be licensed as such, rather than as a storage facility (the only alternative available under the current Regulations). The change also requires HSE to define "bulk quantities" of radioactive wastes in such a way that disposal facilities containing only small quantities of radioactive wastes or wastes with very low concentrations of radionuclides need not be licensed. A public consultation on the change to the Regulations and definition of bulk quantities was due to begin in spring 2009.

Environment Agency Guidance on Requirements for Authorisation of Geological Disposal Facilities

8.6 The three environment agencies (EA, the Scottish Environment Protection Agency (SEPA) and the Northern Ireland Environment Agency (NIEA)) have together revised the Guidance on Requirements for Authorisation document for disposal facilities on land for solid radioactive wastes (the GRA). There are now two GRA documents: one for geological disposal facilities and one for near-surface disposal facilities. The near-surface disposal guidance document was produced jointly by EA, SEPA and NIEA. The geological disposal guidance document was produced by EA and NIEA. SEPA was not a joint sponsor of the geological disposal document because the Scottish Government has a policy of near-site, near-surface storage for higher activity wastes, rather than geological disposal. Both documents were issued for public consultation in 2008; final versions were issued in February 2009 (EA & NIEA, 2009; EA *et al.*, 2009).

8.7 CoRWM attended workshops on the geological disposal facilities GRA and submitted comments on the draft document (EA & EHS, 2008). In CoRWM's view, the new GRA is a great improvement on the previous version. It sets out much more clearly how geological disposal facilities will be regulated and what is required of the developers of such facilities. The guidance on environmental safety cases for these facilities is particularly welcome (EA & NIEA, 2009).

9 LAND USE PLANNING

Development Planning

9.1 Under the present Town and Country Planning regime in England and Wales, Local Planning Authorities are important players in the decision-making process.

9.2 In England and Wales, national planning policy is set out in the Planning Policy Statements (PPS). The primary focus of plan making is then at regional and local levels. Regional Spatial Strategies (RSSs) set out a spatial plan for the region that must conform with Government policy. Local Development Frameworks (LDFs) are a series of documents that outline local planning strategy, identify specific sites for development or conservation, and criteria against which specific development proposals will be judged. The LDF defines a local authority's policy on the development of land. A particular type of LDF, the Minerals and Waste Development Framework (MWDF), covers minerals and waste policy. In two tier areas, minerals and waste matters are the responsibility of the County Planning Authority.

9.3 It is possible to incorporate policies on storage and/or disposal of radioactive waste in Minerals and Waste Development Frameworks and also to set out an authority's policy on Community Benefits. However, it is of concern that the decision on whether to have such policies is at the discretion of the Local Planning Authority (LPA) unless directed to include policies by the Secretary of State. Cumbria County Council is one of the few local authorities that have such policies. Thus, even in authorities where nuclear sites are being decommissioned, there is a lack of consistency on whether radioactive waste is included in the MWDF, other statutory planning documents or not at all.

9.4 In CoRWM's view, Government Regional Offices should be proactive in ensuring that planning policies for radioactive waste storage and disposal are incorporated in the local development frameworks of local authorities that have major nuclear sites.

New Planning Provisions

9.5 Secondary legislation to implement the provisions of the Planning Act 2008 has yet to be made. The most radical change is the creation of an Infrastructure Planning Commission (IPC) which will be mandated to determine applications of national importance in accordance with a framework set out in National Policy Statements issued by Government following consultation.

9.6 The operating procedures of the IPC are yet to be finalised but a consultation paper is to be issued by Government in the summer of 2009.

9.7 At the moment, a GDF does not come within the list of nationally significant infrastructure projects to be covered by the Infrastructure Planning Commission in England. Although the White Paper states that "Government is currently inclined to look towards applying the new planning system" (*Para 5.50*), the final decision has not yet made.

9.8 Although the Act applies to England and Wales, because planning is a devolved matter in Wales, detailed implementation will be different in the two administrations.

9.9 CoRWM considers that Government should explain how local stakeholders would have an opportunity to influence the outcome of the planning application process for a GDF if the application is referred to the Infrastructure Planning Commission.

Development Management

9.10 The voluntary approach to securing a GDF is based on the concept that local communities will play an active, participatory role in site selection.

9.11 The White Paper (*paras 5.34 – 5.37*) sets out the Government's position on the staging of planning permissions with particular reference to underground investigative work that is included as an element of the site characterisation studies to be undertaken at the beginning of Stage 6 of the siting process (Fig. 1). Previously a two-stage approach to planning applications was to be adopted. Now, the NDA is exploring a single planning application approach because of public concerns with the Nirex staged approach in the 1990s for a facility in Cumbria.

9.12 References in the White Paper to a 'parameter-based' approach "where the characteristics of the facility would be defined in such a way as to allow the environmental and other impacts of the proposal to be described, and any appropriate mitigation measures to be identified" (*Para 5.36*) are unlikely to give confidence to local communities that a single application, should this approach be adopted, will not prejudice their opportunity to make representations at the appropriate time.

9.13 In Wales, all local authorities as well as the three National Park Authorities are local planning authorities. Submission of any planning application will be to the LPA but it is likely to be "called in" for determination by the Welsh Assembly Government in accordance with the existing statutory consenting regime in Wales.

9.14 CoRWM is of the view that the NDA should confirm that, if only one planning application is made to cover both underground investigations and disposal facility construction, it will agree hold points as conditions attached to any approval of the application, so as to engage with the local community on the results of the investigations prior to the commencement of any construction work on the facility.

10 STRATEGIC ENVIRONMENTAL ASSESSMENT

10.1 CoRWM participated in the NDA Consultation on a 'Framework for Sustainability Appraisal and Environmental Assessment for Geological Disposal'. CoRWM members attended the NDA workshop on the proposed Framework and, after discussion at a CoRWM plenary meeting, submitted a formal and unanimous response to the NDA (CoRWM doc. 2477). CoRWM considers that the NDA conducted extensive preparatory work and rigorous consultation on the assessment processes that they propose in their Consultation Framework on Strategic Environmental Assessment (SEA), Sustainability Appraisal (SA) and Environmental Impact Assessment (EIA). Whilst a number of recommendations were made, CoRWM considers that the proposed Framework meets current legal requirements for SEA, SA and EIA and that principles of good practice have been incorporated.

10.2 CoRWM is pleased to note that the NDA has incorporated its recommendations in a revised draft which took into account written submissions from consultees. CoRWM also welcomes the fact that it was consulted by the NDA on the final draft of the proposal and that its recommendations were incorporated.

10.3 CoRWM welcomes the fact that SEA, SA and EIA will be utilised as appropriate at all stages (both at strategic and local levels) of the implementation of geological disposal to inform key decisions. CoRWM also welcomes the proposals for extensive consultation with stakeholders and the public, peer review of all assessments and the establishment of an independent Advisory Group. Given that SEA/SA is evolving both in terms of legal requirements and good practice, CoRWM recommended that these elements will need to be incorporated into the process that the NDA plans to implement.

10.4 CoRWM, in its response, stressed the importance of including the Community Siting Partnerships in all stages of the SEA, SA and EIA processes.

10.5 CoRWM considers that the results of any Assessments conducted which identify the scope, nature, magnitude and spatial extent of any potential impacts could assist volunteer communities in their negotiations as to the type of financial or other forms of assistance, which might be considered a necessary part of a Community Benefits Package to mitigate any negative impacts.

11 INVENTORY OF RADIOACTIVE WASTE

The 2007 UK Radioactive Waste Inventory

11.1 CoRWM examined the 2007 UK Waste Inventory in terms of its implications for geological disposal. In May 2008, the Committee was provided with copies of near-final drafts of the documents to be published by Defra/NDA on the 2007 UK Radioactive Waste Inventory. Subsequently in August 2008, each Member of CoRWM was supplied with the Defra-NDA CD including all final Inventory documents and electronic files.

11.2 Four main documents have been produced by Defra-NDA to describe the 2007 Inventory of Radioactive Waste. These are (Defra & NDA, 2008a-d):

- Radioactive Wastes in the UK: A Summary of the 2007 Inventory
- The 2007 UK Radioactive Waste Inventory – A Review of the Processes Contributing to Radioactive Wastes in the UK
- The 2007 UK Waste Inventory – Main Report
- Radioactive Materials Not Reported in the 2007 UK Radioactive Waste Inventory.

11.3 These documents are underpinned by an extensive set of electronic data files detailing the characteristics of each and every identified waste stream. In addition, a distillation paper is produced for international statutory reporting.

11.4 The Inventory is a "snapshot" of wastes in existence and committed to be produced as of 1 April 2007. The process of producing this snapshot included verification of key details by the NDA and waste producers, and progressive improvement in quantification, including identifying and narrowing "error bands". As a result, the UK Waste Inventory is one of the most detailed in the world, produced for use in this country and to assist in meeting international obligations. The Inventory documents collectively form a thoroughly researched and invaluable information resource, useful for various stakeholders and the public.

11.5 A commentary and critique of the near-final draft 2007 Inventory documents was produced based upon review of the Inventory papers over the period 29 May to 4 June 2008 (CoRWM doc. 2367). In its initial commentary on the 2007 Inventory documents, CoRWM recognised that the assumptions made in the calculations of waste volumes, packaged volumes and waste activities were well explained and the underlying uncertainties made clear. Importantly, the Main Inventory Report was structured very effectively to enable a knowledgeable reader to use the information provided in the Appendices.

11.6 CoRWM recognised that the information in the Inventory is only a summary of that which is required for decisions on the management of each waste stream and for making safety cases for waste management operations such as conditioning, packaging, storage and transport. This more detailed information is held by the sites where the waste is produced and stored. In the case of some legacy wastes, the necessary information will only be obtained after the wastes have been retrieved from old facilities.

11.7 CoRWM also noted that there are several areas of uncertainty and likely change that impact on which wastes will actually be destined for geological disposal. Examples are:

- changing lifetime plans and end dates for the existing power stations – these act to extend rather than shorten the time scales of waste production
- estimates of conditioned waste volumes are based largely on existing practice, not on proposals being investigated for future use
- treatment options for irradiated graphite
- the implications of Scottish Government policy for near-site, near-surface storage rather than geological disposal
- the fate of the UK's stockpile of plutonium
- how much spent fuel from existing reactors will be reprocessed
- proposals for new reactors.

11.8 In addition there are a number of wastes and potential wastes for which alternatives to geological disposal are being sought. Examples that may particularly influence the volume of waste for geological disposal are:

- bulk irradiated graphite, for which treatment options are being investigated
- uranium, for which options for recycling are being examined.

Request for a 'Future Scenarios' Document

11.9 It is clear that potential host communities need information about the wastes that might be placed in a GDF, were one to be built in their area (CoRWM doc. 2488). The type of information required includes the total quantity of waste that might be disposed of, the rate of waste emplacement, an indication of when particular types of waste (*e.g.* HLW, spent fuel) might be emplaced, and estimates of uncertainties in all these. The UK Inventory is not designed to provide such information.

11.10 CoRWM therefore requested that the NDA (with DECC) produces a 'Future Scenarios' document that provides an overview of what wastes might be placed into a GDF over time (CoRWM doc. 2438). CoRWM envisaged that this document would be complementary to the UK Inventory, and that it would incorporate the following:

- An overview of the process by which the NDA will plan and deliver geological disposal, linked closely to the waste types, volumes and activities to be delivered to a GDF over time.
- Adoption of a waste inventory classification based on that used by CoRWM in its 2006 Final Report, based on its paper "Radioactive Wastes and Materials Inventory" (CoRWM doc. 1279).
- A suite of limiting scenarios that provide upper and lower bounds on the types of waste to be disposed of with time. For example, limiting scenarios for reprocessing of spent fuel, both in the UK or abroad, could be examined and incorporated into a set of scenarios.

- An assessment of uncertainties in the figures that arise from the scenarios used. All sources of uncertainty should be clearly identified and assessed, including conditioning and packaging options. The integrated picture that emerges from consideration of all the sources of uncertainty should be presented. Chapter 17 of the CoRWM Final Report 2006 provides a useful outline of many of the sources of uncertainty (CoRWM doc. 700).
- An outline of the R&D in progress and planned on waste treatment, conditioning and packaging that may affect the volume of waste destined for geological disposal or the schedule for delivery to a GDF.

11.11 The suggestions in CoRWM document 2438 were discussed at a meeting between CoRWM and DECC on 3 November 2008. This led to the following developments (CoRWM doc. 2482):

- DECC indicated that it would look at evolving the Inventory to include or be supplemented by additional material in the light of the 'Future Scenarios' request in CoRWM doc. 2438.
- Future DECC ambitions in relation to the Inventory include more frequent, possibly annual, publication, and the inclusion of more information on potential scenarios that could inform local communities.
- DECC would be meeting the NDA, waste producers and regulators to identify a strategy for producing the 2010 Inventory, including what information local communities might need about potential wastes.

NDA Work on the Inventory for Geological Disposal

11.12 For its planning purposes and safety case work (and consistent with historical practice), the NDA is compiling further data on the inventory of wastes that may be destined for geological disposal. This "derived inventory" is directly based on information from the UK Inventory but is extended to present the information needed for geological disposal system design and safety case development.

11.13 Data are prepared on the characteristics of conditioned wastes on a waste package and aggregated total basis. Information will be provided for all categories of higher activity waste, or materials that may be declared to be higher activity waste, identified in the White Paper and is to be presented in modular form so that studies can explore different disposal inventory scenarios. This approach allows two types of uncertainty to be addressed: uncertainty about which types of wastes may be destined for geological disposal, and uncertainty about the quantities and characteristics of those wastes. For example, the approach could deal with uncertainty about whether a particular type of spent fuel will be reprocessed or disposed of directly, and with uncertainty about the radionuclide content of that fuel.

11.14 As implied in the White Paper, any agreement with a community on a preferred site for a GDF will need to address both an initial estimate of the quantities and types of waste for disposal and means of dealing with changes in this estimate, both before and after disposal has started (Defra *et al.,* 2008). In the meantime, NDA has indicated that its planning and safety case work will consider an 'upper

bound' inventory as well as a range of other scenarios (CoRWM docs. 2304, 2472).

12 DEVELOPING CONCEPTS AND DESIGNS FOR GEOLOGICAL DISPOSAL

12.1 Discussions between CoRWM, NDA and DECC have confirmed that the strategy for designing for geological disposal is at a very early stage of development (CoRWM doc. 2526). As the MRWS site selection process involves a voluntary approach, it is difficult for NDA to prepare a definitive plan for delivery of geological disposal. However, NDA has developed a Geological Disposal Facility Provisional Implementation Plan (GDF-PIP). It is also developing a generic Disposal System Safety Case (DSSC) based on a range of disposal facility concepts appropriate for different geological environments.

12.2 Information on the GDF-PIP and the DSSC work is summarised below, based on presentations to CoRWM by the NDA-RWMD in September and December 2008. Some other topics that are important in the development of geological disposal concepts and GDF designs are then addressed. These topics are:

- the process of producing a design for a GDF
- the various issues involved in deciding whether all higher activity wastes should be placed in a single GDF or whether, for example, it would be preferable to have one facility for ILW and one for HLW and spent fuels
- the possible use of deep borehole disposal for particular types of waste
- the extent to which "retrievability" should be incorporated in designs
- options assessments.

The Geological Disposal Facility Provisional Implementation Plan: GDF-PIP

12.3 CoRWM was introduced to the GDF-PIP concept and programme at its September 2008 Plenary through a presentation on behalf of RMWD (NDA, 2008b).

12.4 The current version of the GDF-PIP is a first attempt to describe the scope, schedule and cost of developing a GDF. It is intended to provide a platform for planning based on a set of assumptions that may change. RWMD has noted that the assumptions are purely to provide a framework for plan development. They are **not** statements of intent. The GDF designs (or concepts) and geology types are generic and this first version of the PIP was developed before the June 2008 White Paper was published (Defra *et al.*, 2008).

12.5 The scope of the PIP is to "develop, build, operate and close a single GDF for higher activity waste" (NDA, 2008b). The RWMD has therefore incorporated a basic underlying assumption that there will be **one** GDF to hold all higher activity waste. Further assumptions and exclusions are noted below.

12.6 *Assumptions* in the first GDF-PIP that bound the scope of the GDF programme, and its cost, include the inventory for disposal, the programme duration, the geological environment offered, and the disposal concepts applied. The central assumption is that the GDF design will be determined by the type of geology offered by the host community and hence will not be finalised for many years.

12.7 *Exclusions* relevant to the formulation of the first PIP include those related to policy decisions yet to be taken and to construction and operation of a GDF:

- plutonium, uranium, waste from new build power stations and fuel from Ministry of Defence (MoD) operations (but NDA has work in hand on these topics)
- transport logistics and organisational arrangements to provide transport containers
- provision of a packaging plant.

12.8 The following costs are also excluded:

- post-closure institutional control costs (because these are assumed not to be the responsibility of the NDA as the delivery organisation)
- costs for engagement and community benefits packages (because these will be funded directly by Government).

12.9 The GDF-PIP assumes that two candidate sites will be identified by Government by mid 2012 and that site investigations of these will take place for a decade beyond 2014 (2014-2025). It is assumed that these investigations will lead to selection by Government of the preferred site in 2025, after which time construction and ongoing investigation will take place to enable first waste emplacement of ILW/LLW by 2040. It is assumed that HLW and spent fuels that are declared to be wastes will not be emplaced prior to 2075.

12.10 The PIP is aligned with five principal phases in the GDF programme, which control how implementation can be planned:

i. Desk Based siting studies (corresponding to MRWS Stages 1- 4, Fig. 1)
ii. Site Investigation (corresponding to MRWS Stages 5 and 6)
iii. Construction to First Waste Emplacement (Stage 6)
iv. Operation and further construction
v. Closure.

i. *Desk Based Siting Studies Phase*: This has commenced with the call for Expressions of Interest before moving forward following a Decision to Participate. The initial work includes working with communities, developing the disposal concepts, maintaining and updating the 'baseline' inventory, as well as assessing the implications of materials not currently regarded as waste and providing advice on packaging. Also there will be an assessment against pre-set criteria that Government can use to decide which site(s) should be carried forward for physical investigations.
ii. *Site Investigation Phase*: This will commence once candidate sites have been identified. The process again involves working in partnership with potential host communities. Site investigations will acquire information on geological, hydrogeological, socio-economic and environmental conditions for the sites that will greatly expand upon the information obtained in the Desk Study phase. These will in turn provide the basis for development of site-specific safety cases, including packaging options, and interact with

the cases to develop the (up until this stage) generic or largely generic disposal concepts into potential designs that will be site-specific. At the end of this stage, the preferred site to build a GDF will be chosen by Government.

iii. *Construction Phase*: It is envisaged that this will involve at least one cycle of design refinement, coupled with submission of planning and regulatory applications and be informed by subsurface investigations and testing to demonstrate performance.

iv. *Operational Phase*: This will be aligned to the Life Time Plan of the GDF SLC. Construction will be ongoing, concurrent with operation. For example, construction to first emplacement of ILW in vaults or caverns will take 15 years, but HLW will not be emplaced until (probably) 25 years later. The NDA is incorporating 'options for retrievability' into the GDF operational structure and design.

v. *Closure Phase*: Closure of the GDF will be decided in consultation with all stakeholders. Closure, which will take 10 years, includes the decommissioning of all facilities, and the backfilling of excavations with high permeability mass infill and low permeability seals and cappings.

12.11 The NDA is, in parallel with the PIP, developing a parametric cost model that can be varied (or 'flexed') in order to evaluate the impact of changes in the GDF-PIP on costs. The NDA has been using the model to examine a range of scenarios that challenge some of the basic assumptions and exclusions inherent to the PIP. One of the features of this parametric cost model is that any combination of parameters can be changed or varied: it does not build in any conditional criteria on whether the resulting GDF could be operated or closed. The NDA considers that as long as this is recognised, the high-level cost estimate can be used as an evaluation tool. One current example of this type of use is as part of the determination of how much a unit of new build waste would 'cost' to dispose of in the GDF. A priority of current work on this cost model is its validation for at least the most general assumption set described above.

12.12 While development of the first GDF-PIP was a useful exercise for internal planning, RWMD recognises that it needs to produce a shorter and more accessible document on planning for geological disposal, for use in discussions with potential host communities, other stakeholders and the public. This document will be aligned with the requirements of the 2008 White Paper and the 2009 GRA. CoRWM welcomes the production of such a publicly available document.

Disposal System Safety Case

12.13 The NDA has commissioned studies that consider disposal concepts in several geological settings. One study was for ILW (Hicks *et al.,* 2008) and one for HLW and spent fuel (Baldwin, Chapman and Neall, 2008a, b). The HLW report considers twelve disposal concepts for various types of HLW across five geological settings. In parallel with this work, the Environment Agency held and led workshops on geological disposal concepts that might be employed in different geological settings (Quintessa, 2008), albeit not precisely those applied in the NDA reports. Following completion of its own studies identifying geological disposal concepts that have been, or are being, considered internationally, NDA

is now examining several geological disposal concepts in its *Disposal System Safety Case* Project. RWMD argues, and CoRWM agrees, that it is not appropriate to choose between concepts at this stage. Instead, RWMD will examine the concepts that might be appropriate for selected but differing geological settings and consider how the safety cases for those concepts could be developed.

12.14 CoRWM was introduced to the DSSC at its December Plenary meeting (CoRWM doc. 2472). The outline below is based on CoRWM's understanding of this presentation.

12.15 The DSSC will be an integrated safety case that is intended to cover the transport of waste to the GDF, construction and operation of the GDF, and long-term safety for people and the environment. It is 'modular' in design, built from modules / subsets of work that are tied and tailored to submissions for regulatory approval. CoRWM understands from this that it is intended to be 'tuned' to the regulatory processes including staged authorisation (Section 8) with a top level overview document supported by other documents with increasing levels of detail for those who require it. At present, the DSSC is generic but it will become site-specific in the future, when sites have been selected for investigation and during the investigation phase.

12.16 The DSSC has three main components, or 'Cases', each tailored and developed for the appropriate regulatory authorities. These are as follows:

- *Transport Safety Case:* An analysis of overall transport safety, to inform a generic transport system design. This will be submitted to the Department for Transport for comment. It is separate from waste producers' submissions to Department for Transport for approval of their transport packages, in which package performance under normal conditions and also in potential accident scenarios (drop, fire, immersion) is considered.
- *Operational Safety Case:* An analysis of safety based on existing safety case methodologies is used to inform an outline facility design that meets the requirements of HSE (HSE, 2006). There is a requirement to consider a number of potential scenarios including equipment failures, external events and human errors.
- *Environmental Safety Case:* This involves a post-closure safety analysis that is based on arguments and modelling. This case is focused on the principles and requirements given in the GRA (EA & NIEA, 2009).

12.17 The DSSC will be developed in an iterative manner underpinned by a cycle involving two-way links and interactions between the specification of the Disposal System, the system design, supporting R&D and safety assessment. Whilst it is not clear to CoRWM how this structure will work in practice, it is apparent that this type of integration is required because the three lines of 'Cases' are not independent.

12.18 Safety arguments are being developed using evidence bases appropriate to the particular case. For example, in the case of transport and operational safety, this evidence base is derived from engineering processes, practices and controls. For environmental safety, the case evidence principally rests with the multi-barrier

concept and the safety functions associated with each barrier considered over time. The NDA presentation emphasised that the geological barrier is intrinsic to the multiple barrier concept (waste form, waste container, buffer or backfill, natural geological barrier). A guiding principle of the development of safety arguments is that they are supported by multiple lines of reasoning. Modelling of the system in terms of safety is based on inputs from a suite of sub-models, themselves developed by linking of process models specific to the safety functions of parts of the multiple barrier system. Success is gauged in terms of confidence that "regulatory requirements can be met".

12.19 As noted above, the principal driver is "making a robust safety case". It is recognised that long-term safety assessment will require improved understanding in a number of areas such as the long-term evolution of wastes, barrier performance and movement of radioactivity in the environment (CoRWM doc. 2472). The R&D needs of RWMD, and its level of collaboration in international projects, will be guided by this requirement. In effect, the R&D strategy and effort of RWMD is predicated upon the needs-driven concept of "making a robust safety case". This will be commented upon further in the CoRWM Research and Development Report which is scheduled for submission to Government in October 2009 (CoRWM doc. 2543).

12.20 It is also recognised (CoRWM docs 2472, 2482, 2484) that there are several key uncertainties (*e.g.* groundwater flow; radionuclide sorption; GDF design optimisation for geology; ^{14}C transport as gas or dissolved species, microbial effects) and that the magnitudes of these will need to be explored through R&D. In order to manage uncertainty, the DSSC uses conservative assumptions and aims to apply probabilistic uncertainty analysis and sensitivity analysis.

12.21 NDA work currently being carried out in relation to the DSSC project includes:

- Development of methodologies and safety arguments to be discussed with regulators.
- Preparation of worked examples of Safety Case arguments for three generic geological environments: strong rock, lower strength sedimentary rock and evaporites. These utilise example GDF concepts from international examples, and the results of the commissioned reports (Baldwin *et al*., 2008a,b ; Hicks *et al.*, 2008).

12.22 The DSSC can only be generic at this stage. As a consequence, the relative importance of the various 'activities' cannot be assessed. The modelling of the disposal system in terms of post-closure safety has been described as using inputs from a suite of sub-models, themselves developed by linking of process models specific to the safety functions of parts of the multiple barrier system. This appears sound in principle, but it is not clear what happens in practice and how this can be achieved. For example, how the integration and linkage is managed (and even recognised) is not apparent from the material examined by CoRWM so far, as the relevant flow diagrams are indicative rather than explicit. In addition, it is important to recognise that even with sophisticated modelling the accuracy of the output is determined by the input data, the boundary conditions and the representation and understanding of the underlying physical, chemical and biological processes.

12.23 CoRWM is also unclear how DSSC development is to be integrated with GDF design and site assessments (desk-studies and surface-based investigations), and how DSSC work will provide input to choices between alternative geological disposal concepts and GDF designs. For these purposes, CoRWM would have expected there to be more emphasis on safety assessments (*i.e*. investigations of whether combinations of inventory, geological environments and disposal concept or facility design are safe), than on safety cases (*i.e.* demonstrations that combinations of inventory, geological environments and disposal concept or facility design are safe).

12.24 The DSSC will be described in a hierarchy of documents, many of which will be provided to key stakeholders for review. Several of the documents will be publicly available, including an overview of the generic DSSC.

GDF Design Process

12.25 The design of a GDF is a large and complex multi-disciplinary project requiring a broad spectrum of skills. There are two stages in the production of a design for a GDF: concept development and design development.

12.26 CoRWM uses the term 'concept' to encompass a wide range of variants of geological disposal, including variants involving more than one facility. For example, one concept would be a single GDF in which one part is for ILW, LLW and uranium, and the other part is for HLW, spent fuel and plutonium. Another concept would be separate GDFs for ILW etc. and for HLW etc. Other concepts would be separate or combined GDFs that are tailored more specifically to waste types. Depths range from about 200m (considered to be the minimum required to provide protection in the event of a future glaciation) to more than a kilometre.

12.27 By 'design' CoRWM means the detailed drawings and specifications that will allow construction of a disposal facility encompassing *inter alia*, nuclear, civil, mechanical, electrical, materials, chemical, geotechnical and geological engineering aspects. It is normal practice for large projects to undergo design development in stages, with completion of each stage being approved after checking against predetermined criteria. These criteria could be, for example, the degree of design development, degree of cost certainty or the certainty in the knowledge underpinning the design. In the case of a GDF, it will be particularly important to demonstrate that the knowledge underpinning a design is sufficiently robust to demonstrate safety and to withstand independent scrutiny. Care is therefore required not to confuse conceptual plans with design. With reference to a GDF, the latter requires a great deal of scientific and technical input.

12.28 It is at the early stages of large engineering projects that the greatest impact can be made in managing project risk. This is because it is during the developmental stages that many of the major decisions affecting design efficacy and out-turn costs are made. CoRWM considers that design should commence with an integrated review of disposal concepts, underground engineering constraints and the engineered barrier design. The programme outlined in the June 2008 White Paper currently does not identify a specific period for design development nor is CoRWM aware that NDA has defined a process for design development.

12.29 The NDA commissioned two reviews of disposal concepts. Geological disposal options for HLW and SF were the subject of a comprehensive study reported in 2008 (Baldwin *et al.,* 2008a, b). A similar exercise was carried out for ILW (Hicks *et al*., 2008). In parallel with these studies, the constraints on the GDF imposed by the design of underground openings, construction practices, and facility operation and maintenance (including retrievability) should be assessed. This will allow any knowledge gaps to be identified and appropriate R&D initiated (CoRWM doc. 2543).

Number of GDFs

12.30 Government has indicated a preference for a single GDF for all higher activity waste but has stated that the final decision will be taken in the light of technical, scientific and other factors (para 4.25, Defra *et al.*, 2008). In the concepts for a single GDF currently being considered by the NDA, the ILW (and LLW) would be in a separate part of the facility from the HLW and spent fuel, and the two parts of the facility would be located in such a way that there would be no unacceptable interactions between their respective near-fields. These concepts are referred to as a combined or **co-located** GDF (Defra *et al*., 2008). A key technical and scientific question is whether it is possible to find a site that will be suitable for such a facility and to demonstrate that there will be no unacceptable near-field interactions over sufficiently long time periods. This is important because of the possible effects of cement-bentonite interactions and of alkaline waters on HLW (CoRWM docs. 2456, 2484; NUMO, 2004; USDOE, 2008). These are discussed below.

Cement-Bentonite Interactions

12.31 Bentonite features in several geological disposal concepts for hard rocks as a buffer material around HLW and spent fuel packages. It is an altered volcanic ash in which the main mineral constituent is montmorillonite (a clay mineral). Water-saturated, highly compacted bentonite is regarded as a good barrier material for a number of reasons. It has a low enough permeability to restrict groundwater movement but a high enough permeability to allow the movement of gases generated by metal corrosion. It has a high sorption capacity and may filter out colloids. It also has an appropriate thermal conductivity.

12.32 Cement features strongly in UK concepts for geological disposal of ILW and LLW as a waste conditioning material and a buffer and backfill material. Ordinary Portland cement (OPC) is already an intrinsic part of the packaging for about 10% of the ILW inventory. As a buffer and backfill it provides a “chemical barrier” to radionuclide movement because it creates a high pH environment in which most radionuclides have a very low solubility (*e.g.* Glasser, 2001). It is sufficiently permeable to allow gas movement but has a low enough permeability to restrict water movement. It is envisaged that cement-based materials will be needed during the construction stage, for grouting, strengthening and tunnel casing in both the ILW-LLW and HLW-spent-fuel parts of the co-located concepts being considered by the NDA.

12.33 The implications of cement-bentonite interactions were discussed at a NUMO-Posiva meeting in 2004 (NUMO, 2004). Some of the uncertainties relate to the adverse effects of bentonite permeability reduction (*via* swelling and mineral

deposition or cementation) on gas transmission, the effects of time-dependent reactions and alkaline front migration on bentonite physical performance, the timescales of exhaustion of buffer capacity in highly alkaline systems, and the applicability of current experimental approaches to the natural systems. Of particular concern are the effects of an alkaline, cementitious environment on the swelling properties of bentonite.

Impact of Alkaline Waters on HLW

12.34 The generation of highly alkaline fluids through groundwater–cement interactions may also impact on vitrified HLW in a combined HLW and ILW facility through fluid-glass interactions (Hoskin & Burns 2003; Grambow 2006; Geisler *et al*., 2007; Putnis & Geisler, 2007). This could occur after HLW canisters had corroded and the vitrified HLW came into contact with groundwaters that had traversed the cementitious environment in the ILW part of the facility.

12.35 There are uncertainties about the reactivity of borosilicate glasses in these circumstances and about whether radionuclides are immobilised through mineral precipitation, or rendered mobile and then transported in alkaline but also saline fluids. Borosilicate glasses may be durable or relatively unreactive in the presence of static aqueous fluids that have low salinities (Grambow, 2006). However, recent experiments have indicated that they are far more reactive, and hence have weaker performance and durability, when interacting with more complex fluids that approach natural salinities and contain natural solutes (*e.g.* Grambow, 2006; Geisler *et al.,* 2007). UK glasses are more reactive than the French equivalents owing to their high Mg content (Abraitis *et al*., 2000), illustrating the need for caution in using experimental data from overseas. There is a clear need for further experiments on borosilicate glass stability in the presence of complex alkaline and saline fluids under both static and dynamic (*i.e.* with fluid flow) conditions (CoRWM doc. 2543).

Implications for Site Selection and GDF Design

12.36 In light of the discussion above, CoRWM considers that, given the present state of knowledge, the most appropriate course of action is to locate waste emplacement areas in such a way that there is essentially no possibility of cementitious materials or highly alkaline groundwater coming into contact with bentonite or vitrified HLW for very long time periods. Whether this can be achieved in a single GDF depends largely on hydrogeological conditions at the particular site and, to a lesser extent, on GDF design. It will be some considerable time before candidate sites have been investigated in enough detail to determine whether they are suitable for a single combined GDF for all higher activity wastes. In CoRWM's view, it is important in the meantime to give the same degree of attention to geological disposal concepts with more than one GDF as to concepts with a single combined GDF.

Volume of Rock Required

12.37 A clear advantage of having one GDF rather than two (or more) is the ability of the various parts of the GDF to share surface facilities, access tunnels, construction support and security provision (para 4.25, Defra *et al.*, 2008). Whether such sharing will be possible depends on whether a site can be found in which there is a large enough volume of suitable rock.

12.38 The ILW-LLW part of a GDF will require a considerable volume of rock because of the volume of waste to be emplaced (some 275,000 cubic metres based on the 2007 UK Inventory (Defra & NDA, 2008a-d)). The HLW-spent-fuel part of a GDF will contain a much smaller volume of waste but will require the same or a greater volume of rock because waste packages must be spaced out to avoid unacceptably high rock temperatures.

12.39 Situations can be envisaged in which a site could accommodate one part of a combined GDF but not both, or where the distance between the two volumes of rock is so great that it would be preferable to have separate surface facilities and access tunnels or shafts. Until surface-based investigations have been carried out, and some uncertainties about the inventory of wastes for disposal are resolved (Section 11), it is important for the NDA to consider concepts with more than one GDF, as well as concepts with a single combined GDF.

Possible Use of Deep Boreholes

12.40 In its response to CoRWM's 2006 recommendations, Government stated that the framework for implementation of geological disposal would include monitoring of international R&D into geological disposal technology, including new options such as the use of deep boreholes for disposal of some wastes (UK Government *et al*., 2006). In the June 2008 White Paper, Government stated that the NDA would keep options such as borehole disposal under review and would estimate the cost implications of various options (Defra *et al*., 2008).

12.41 Deep borehole disposal involves drilling boreholes of nominally 0.5m diameter from the surface to depths of up to 5km. It would only be suitable for wastes with relatively small volumes. It would provide considerably more isolation than disposal in a mined repository, the facility would have a much smaller footprint than the mined equivalent, the cost might be very much less and the option could be implemented over a shorter time span. Current disadvantages of the option include uncertainties about waste emplacement procedures and the lack of detailed operational and post-closure safety assessments (Baldwin *et al*., 2008a, b).

12.42 CoRWM is concerned that the NDA may dismiss deep borehole disposal at too early a stage in concept development. It would then have difficulty assessing the option if the need to do so arose at a later date, for example if there were difficulties in making the safety case for a particular type of higher activity waste in a mined repository. CoRWM therefore encourages the NDA to both keep up to date with developments in deep borehole disposal and to reassess the viability and potential costs of the option at intervals.

Retrievability

12.43 Retrievability is an important issue for some stakeholders (CoRWM docs. 700, 2488). It was introduced into the Nirex design for ILW following the failure of the application to construct a rock characterisation facility in 1997. Limited retrievability is a legal requirement for the design of geological repositories in Sweden and France (*www.cowam.com*).

12.44 Government acknowledged in the June 2008 White Paper that there is a divergence of views on the issue of whether a GDF should be left open for a period after completion of waste emplacement, with wastes monitored and in a state permitting fairly easy retrieval (Defra *et al.*, 2008). It was stated that "closure at the earliest opportunity provides greater safety, greater security from terrorist attack, and minimises the burdens of cost, effort and worker radiation dose transferred to future generations". It then noted that the timescales for constructing and operating a GDF are long and that there is time for further research. Government decided to leave open the option of retrievability, so that a decision could be made in discussion with local communities and regulators (Defra *et al.*, 2008).

12.45 The term "retrievability" can cover a range of capabilities and in its earlier work, CoRWM found the following definitions useful in distinguishing between some of these (CoRWM docs. 700, 1682).

- Reversibility is the ability to remove the waste by merely reversing the procedures that were undertaken to emplace it. This could be achieved before the vaults, tunnels or other excavations are backfilled.
- Retrievability is the ability to remove the waste from the vaults, tunnels or other excavations before the whole facility is backfilled and closed. It may involve the removal of local backfill.
- Recoverability is the ability to remove the waste from a closed GDF, for example by mining or drilling.

12.46 It is also helpful to refer to providing the capability for reversibility or retrievability for long periods after the waste has been emplaced as 'extended' reversibility or retrievability.

12.47 The Nirex Phased Geological Disposal Concept for ILW was intended to provide the option of extended reversibility for up to a few hundred years after the waste is emplaced. Several studies were done for Nirex to evaluate the implications of providing extended reversibility. The design also allowed for retrievability if the vaults were backfilled, and experiments have demonstrated that the grout could be removed (Nirex, 2005). The Swedish KBS concept for spent nuclear fuel provides retrievability until the main access excavations are backfilled. Experiments have demonstrated that the bentonite backfill can be removed. Discussions are underway in France to determine how the legal requirement for retrievability should be interpreted (CoRWM doc. 2530).

12.48 CoRWM's position on retrievability remains as set out in the 2006 report at paragraphs 15-19 of the Overview (CoRWM doc. 700, pages 10-12). Members agree that early closure is the best course of action. They see no scientific or technical advantages in providing for extended reversibility or retrievability and are of the view that there would be considerable disadvantages. However, members disagree about the degree of influence potential host communities should have on this aspect of GDF design. This is an issue to which CoRWM will return.

Assessments of Concepts and Designs

12.49 It is a regulatory requirement in the UK that those carrying out radioactive waste management activities identify, evaluate and compare a number of options for achieving the desired objective. This requirement arises from the health and safety principle of "as low as reasonably practicable" (ALARP), the radiological protection principle of "as low as reasonably achievable" (ALARA) and the environmental protection principles of "best practicable environmental option" (BPEO) and "best available techniques" (BAT) (HSE, 2006; EA, 2008a, b).

12.50 In the case of geological disposal, developers of GDFs will be expected to show that the geological disposal concept chosen is preferable to alternatives, and that the facility design chosen is optimum for the waste inventory and the site (EA & NIEA, 2009). Environmental impact procedures also require alternatives to be compared (Section 10). In all these cases the comparisons of options need to be based on a number of different factors, including health impacts on people and other living organisms, scientific and technical aspects, socio-economic impacts and financial costs.

12.51 As yet, CoRWM has received little information about how the NDA plans to carry out the necessary option assessments. At the concept level, a wide range of options will need to be considered. These should include disposal in facilities constructed using various techniques, at depths ranging from about 200m to more than 1km, disposal of all higher activity wastes in a single facility, separate facilities for various types of higher activity wastes, and facilities incorporating differing degrees of retrievability. In identifying the concepts to be assessed, the NDA should take full account of recent advances in engineering and mining technologies. It should consider various mined layouts to fit functional and space requirements in each of the relevant geological environments.

12.52 At the design level, what is required is an integrated process such that GDF design, site assessments and safety case development are linked together to provide inputs to decisions on siting and design, including whether or not one GDF will be the best solution. It is not clear to CoRWM whether NDA has plans for such an integrated process, which should include comparisons of design options for each candidate site. The process should be defined in the GDF-PIP and should have clear links to the DSSC.

12.53 It is important that a wide range of stakeholders is involved in option assessments at the concept and design level, including people from potential host communities. Ideally, stakeholders should be involved throughout the process of identifying, evaluating and comparing options, as they are in BPEO studies and were when CoRWM assessed options for the long-term management of higher activity wastes (EA & SEPA, 2004; CoRWM doc. 700).

12.54 At this early stage in the design process, the NDA should avoid giving the impression that it prefers any one concept or design for a given type of geological environment. When assumptions are made for the purpose of establishing waste package specifications or for preliminary safety case work it should be made clear that these have no implications for the choice of geological disposal concept or facility design.

13 SCREENING OUT UNSUITABLE AREAS

13.1 The White Paper states that during Stage 2 of the siting process, following an Expression of Interest by a community, BGS will be asked to apply sub-surface exclusion criteria (SSEC) to the area. This screening will be to identify any areas which, by virtue of their sub-surface characteristics, are not suitable for geological disposal and can be discounted early in the process of site selection. It will help inform the community decision about whether to participate in subsequent stages (Section 3). CoRWM believes that the process of identifying SSEC and defining how they shall be applied was well considered and appropriate.

13.2 In scrutinising MRWS Stage 2, CoRWM has held meetings with the Chairs of both Committees that developed the SSEC (CoRWM doc. 2427), British Geological Survey (BGS) (CoRWM doc. 2436), NDA and DECC (CoRWM doc. 2499), Learned Societies hosted by the Geological Society (CoRWM doc. 2484) and Ground Forum (CoRWM doc. 2525).

13.3 CoRWM believes that the test of unsuitability of a site is a relatively straightforward exercise. The exclusion criteria are physical attributes, the presence of which can be readily identified from existing geological databases.

13.4 The results of the application of the SSEC could have a significant impact on the aspirations of potential host communities. It is therefore important that the process of application is seen to be independent and that the results are independently checked. The White Paper states that the BGS will be responsible for applying the SSEC and that, for each area that expresses an interest, BGS will make a draft report available, for discussion and peer review, to the relevant communities and local authorities, the NDA, the regulators and CoRWM (para 7.12, Defra *et al*., 2008). CoRWM welcomes that White Paper commitment and considers that summary documents should be produced that explain the application of the SSEC and the findings to lay participants in the siting process.

13.5 CoRWM explored, in consultation with the NDA, the scenario where a community offers an area, part of which fails the SSEC test. CoRWM felt it would be useful to clarify whether in this situation the whole or only that part would be rejected. It is CoRWM's understanding of the Government's position that the BGS should identify the area of land, if any, within the total area volunteered by a community that fails the SSEC test. If the area that passes the SSEC screening is sufficiently large to host a geological disposal facility, the process would continue.

14 DESK-BASED STUDIES

14.1 Short-listing sites from desk-based studies is Stage 4 in the MRWS geological disposal siting process (Defra *et al*., 2008).The proposed steps are laid out in an NDA technical note, A Proposed Framework for Stage 4 of the MRWS Site Selection Process which was developed with inputs received from CoRWM, the regulators, the Swedish Waste Management Organisation (SKB) and the London School of Economics. The following details have subsequently been obtained through a discussion meeting with DECC and NDA held in December 2008 (CoRWM doc. 2526)

14.2 In terms of the site selection process, NDA-RWMD is committed to a consultation on the proposals for Stage 4 and on how this will be implemented within a framework of sustainability appraisal and strategic environmental assessment (SA/SEA). Following consultation on a framework for sustainability appraisal and environmental assessment[3] (Section 10), the plan is to agree the SA-SEA framework and then formally consult on the Stage 4 proposals. It is considered advantageous for time to be allowed in this process for potential host communities, having expressed an interest, to participate in the consultation and for their inputs to be taken into account in developing the proposals before they are put to Government for agreement. Until this consultation has been completed and Government has subsequently agreed to a finalised process, it is premature to develop a detailed specification for what will be required, since this is likely to be subject to change. However, planning work is being undertaken by the NDA to understand what geological, environmental and other data are likely to be available, in what form they exist, and how they might be used and communicated.

14.3 With respect to geological data, NDA-RWMD envisages using the national geoscience database maintained by the BGS as the primary source of verified geoscientific data in Stage 4. The current planning work will build on NDA-RWMD existing knowledge on the information that is available. This planning work includes consideration of what information will be required to support an evaluation of whether a suitable facility design could be developed for a candidate site and whether an adequate safety case could be developed for the facility in the future.

14.4 The development of the scientific information that is to be provided as an input to the assessment process at Stage 4 is regarded by NDA-RWMD as an essentially once-through, rather than an iterative, process. Data will be collected, verified, synthesised, appraised and reviewed. There is expected to be an appropriate characterisation of the levels of uncertainty to be assigned to the synthesis of the data. The proposals include a provision for both internal and external review of the scientific information, specifically to allow the identification of further or different information that should be included in the assessment.

[3] NDA Consultation on a Framework for Sustainability Appraisal and Environmental Assessment for Geological Disposal, August 2008.

14.5 The major iteration that is envisaged in the case of geoscientific information available from desk-based studies will occur at the start of Stage 5 of the MRWS site selection process. At this point, the existing information on the number of candidate sites identified by Government for surface-based site investigation will be used to develop a preliminary site model that will provide the basis for the design of the site investigation programme. For example, in the case of any geophysical survey data, this might require reprocessing of the data to support the development of a preliminary geological structural model for the site.

15 CONCLUSIONS AND RECOMMENDATIONS

The Invitation to Participate in the Siting Process for Geological Disposal

The White Paper

15.1 CoRWM is pleased that, in so far as geological disposal is concerned, the White Paper has closely followed CoRWM's earlier recommendations and advice. CoRWM is strongly supportive of the voluntarism and partnership approach to site selection set out in the White Paper.

Engaging with Local Communities

15.2 It is of concern that, at this time, only one part of the UK has come forward with Expressions of Interest. This is particularly so since the geological, technical, environmental and social suitability of any area that expresses an interest will remain unclear for some years.

15.3 Therefore, there is both a need and still time to publicise the invitation to participate more widely. CoRWM welcomes the Government's renewed efforts in 2009 to communicate with local government, stakeholder groups at nuclear sites, Regional Development Agencies and others about geological disposal whilst at the same time working positively with the authorities in West Cumbria who have already expressed an interest in the possibility of hosting a GDF.

15.4 CoRWM considers greater effort is likely to be needed to inform and support local authorities, particularly in non-nuclear areas.

15.5 Some local authorities, including some of those that have made an Expression of Interest, have expressed concerns to CoRWM about what would happen if the present voluntarism approach to site selection failed. They think it is possible that, if they exercised their right to withdraw some way into the site selection process, sufficient work may have been undertaken in their area for Government to select it if the present process failed and a non-voluntary approach were adopted. CoRWM considers that it would contribute to the confidence that local stakeholders have in the current site selection process if Government were to restate its commitment to the voluntarism approach and to indicate that it would consult stakeholders before adopting any other approach.

Managing the Implementation of Storage and Geological Disposal

Decision Making

15.6 CoRWM considers that, because most of the decision-making arrangements for implementation of geological disposal have been in place for less than a year, it would be premature for it to express any views on their overall adequacy or efficiency. However, CoRWM notes that there is a lack of clarity on two aspects of decision making at the local level.

15.7 One aspect was to some extent foreseen in the MRWS White Paper and concerns which local authority (or authorities) should be the Decision Making Body (or Bodies) in situations where there is more than one tier of local government. It has become apparent that Government advice may be required in

such situations. CoRWM encourages Government to provide such advice in a timely way.

15.8 The other aspect of local decision-making where there is currently a lack of clarity is in the identification of potential sites and, therefore, potential host communities, after a Decision Making Body has made a Decision to Participate. It is CoRWM's view that potential sites should only be considered for surface-based investigations where there is credible support in the potential host community. Such support may not be forthcoming unless communities have a clear understanding of how potential sites will be identified and CoRWM therefore encourages Government to provide the necessary clarity.

Funding

15.9 The issue of funding is important to a range of stakeholders and to the wider public. CoRWM's consideration of NDA funding for implementation of geological disposal showed that the main need in the immediate future is for Government and the NDA to consider and explain more fully the mechanisms by which funding will be made available during the various stages of the implementation of geological disposal. It is essential that the issue of intergenerational equity is taken into account.

15.10 CoRWM notes that Government is committed to funding Engagement Packages for communities that have expressed an interest in entering discussions on hosting a geological disposal facility. In Cumbria, the Government has already provided some financial support to the West Cumbria MRWS Partnership. It is important that the formal Government agreements with local authorities to fund Engagement Packages give confidence to communities that sufficient funds will be available for as long as they are required.

15.11 CoRWM considers that Government should begin work to develop the principles that will be used in developing Community Benefits Packages. Based on CoRWM's previous work, it expects these principles to include:

- The package will aim to enhance the wellbeing of areas on which the disposal facility will have a significant impact in both the short and longer term in recognition that they are enabling a national need to be met.
- The package will reflect the future development aspirations of areas.

15.12 Government will also need to set out clearly the process by which the Package will be delivered.

RECOMMENDATION 1
CoRWM recommends to Government that it begins work now to develop the principles to be used in deriving Community Benefits Packages and the process by which Packages would be agreed. This should include work on providing confidence that, once agreed, such Packages will be delivered.

Management of Risks

15.13 CoRWM welcomes the establishment by the NDA and Government of risk management frameworks and risk registers and will monitor how these operate in practice.

15.14 CoRWM looks to local government to develop a risk-based approach to those aspects of implementing geological disposal in which it has a role.

International Experience

15.15 CoRWM considers that important lessons are available from overseas experience and is pleased that the NDA and UK regulators are gaining knowledge from their international counterparts. It is desirable that Siting Partnerships should also be able to benefit from overseas experience, both directly and *via* the NDA and the regulators.

Public and Stakeholder Engagement

15.16 The White Paper acknowledges the importance of public and stakeholder engagement in the geological disposal facility site selection process and identifies the NDA framework for public and stakeholder engagement and communication as a key element.

15.17 When the White Paper was published, Government set up a dedicated website to provide information and indicated a willingness to respond to any approach for information from a community. It responded to a number of approaches and met with communities when asked to do so. It now regularly attends meetings of the West Cumbria MRWS Partnership. It has also commenced a new initiative for raising the profile of the siting process for geological disposal.

15.18 In the case of NDA, CoRWM is concerned that the PSE and communications work of its Radioactive Waste Management Directorate (RWMD) is not yet sufficiently integrated within the overall NDA family. CoRWM thinks that RWMD should work more closely with the rest of the NDA to produce an overall PSE and communications strategy that will take account of the fact that the RWMD will, in due course, become the site licence company that will be the delivery organisation for geological disposal.

15.19 CoRWM itself undertook PSE in the preparation of this report. A consultation draft was placed on the website and copies were sent to a number of stakeholders. Bilateral meetings were held with NuLeAF and the NDA whilst a stakeholder workshop was held in Cumbria to discuss the draft report.

Regulation and Permitting

The Regulators – the Regulatory Framework

15.20 CoRWM welcomes the moves towards setting up a joint regulators' team and office for geological disposal. It also welcomes the revised Environment Agency guidance on geological disposal (the GRA).

15.21 CoRWM is pleased that steps are being taken to make the legislative changes needed to allow staged authorisation of a geological disposal facility under the

provisions of the Radioactive Substances Act 1993 and to allow geological disposal facilities to be licensed as such under the Nuclear Installations Act 1965. These changes will provide greater clarity to potential host communities about the regulatory framework for geological disposal.

Land Use Planning

15.22 The new provisions contained in the Planning Act 2008 and the possible change of attitude regarding whether one or more planning applications will be appropriate to deliver a GDF are creating some uncertainty amongst community representatives.

RECOMMENDATION 2
CoRWM recommends to Government that it should explain how local stakeholders would have an opportunity to influence the outcome of the planning application process for a GDF if the application is referred to the Infrastructure Planning Commission.

RECOMMENDATION 3
CoRWM recommends to Government that the NDA and the Government should discuss with communities that have expressed an interest, the advantages and disadvantages of single- and two-stage planning applications for underground investigations and construction of a GDF. In particular, the discussions should cover the hold points, that could be subject to conditions attached to approval of a single application, and opportunities for local stakeholder engagement at such hold points.

15.23 CoRWM considers that the proposed NDA Framework for Sustainability Appraisal and Environmental Assessment for Geological Disposal meets current requirements for SEA, SA and EIA and that principles of good practice have been incorporated.

15.24 CoRWM welcomes the fact that SEA, SA and EIA will be utilised at all stages (both at strategic and local levels) of the implementation of geological disposal to inform key decisions. CoRWM also welcomes the proposals for extensive consultation with stakeholders and the public, peer review of all assessments and the establishment of an independent Advisory Group.

Inventory of Radioactive Waste

15.25 Previously, CoRWM recommended that the NDA (with DECC) produce a "Future Scenarios" paper that would provide an overview of what wastes might be placed over time into a GDF. This would be complementary to the information in the UK Radioactive Waste Inventory. CoRWM welcomes the positive response given to this suggestion.

Development of Geological Disposal Concepts and Facility Designs

15.26 CoRWM welcomes NDA work on its Provisional Implementation Plan (PIP) for geological disposal and its Disposal System Safety Case (DSSC). CoRWM notes that NDA is producing a shorter, more accessible, report on "planning for Geological Disposal" and an overview report on its generic DSSC. The Committee is pleased that both of these will be in the public domain.

15.27 There are two stages in designing for geological disposal: concept development and facility design development. CoRWM considers that option assessments are essential at both stages.

15.28 The NDA is currently at the concept development stage. CoRWM is of the view that, in option assessments at the concept level, it is important to consider a wide range of options. These should include disposal in facilities constructed using various techniques, at depths ranging from about 200m to more than 1km, disposal of all higher activity wastes in a single facility, separate facilities for various types of higher activity wastes, and facilities incorporating differing degrees of retrievability. In identifying the concepts to be assessed, the NDA should take full account of recent advances in engineering and mining technologies. The NDA should keep up to date with developments relevant to deep borehole disposal and reassess the viability and potential costs of this concept at intervals. This will enable deep borehole disposal to be considered for particular types of higher activity wastes if an alternative to other concepts is required.

15.29 In preparation for the design level options assessments, it is necessary to have in place an integrated process of GDF design, site assessment and safety case development. This will enable designs for each candidate site to be evaluated and compared.

15.30 CoRWM believes that a wide range of stakeholders should be involved in option assessments, at both concept and facility design level.

RECOMMENDATION 4
CoRWM recommends to Government that it should ensure that the NDA carries out option assessments in which a wide range of geological disposal concepts is considered. These should include disposal in facilities constructed using various techniques, at depths ranging from about 200m to more than 1km, disposal of all higher activity wastes in a single facility, separate facilities for various types of higher activity wastes, and facilities incorporating different degrees of retrievability. A wide range of stakeholders should be involved in these assessments.

RECOMMENDATION 5
CoRWM recommends to Government that it should ensure that the NDA has an integrated process in place for geological disposal facility design, site assessments and safety case development. The process should be described in publicly available documents that have been reviewed by independent experts and the regulators.

Screening out Unsuitable Areas

15.31 CoRWM welcomes the Government's commitment that the draft BGS report on site screening will be made available to stakeholders and public in the relevant area as well as being subject to peer review.

Desk-Based Studies

15.32 NDA is committed to a consultation on the proposals for Stage 4 of the site selection process and on how this will be implemented within a framework of sustainability appraisal and strategic environmental assessment (SA/SEA).

15.33 CoRWM considers it advantageous for time to be allowed in this process for potential host communities, having expressed an interest, to participate in the consultation and for their inputs to be taken into account in developing the proposals before they are put to Government for agreement.

Progress So Far

15.34 CoRWM welcomes the progress made by Government and the NDA in carrying forward the geological disposal implementation programme set out in the June 2008 White Paper.

16 REFERENCES

CoRWM Documents

Number	*Title*
700	CoRWM's Recommendations to Government 2006
1279	Radioactive Waste and Materials Inventory
1682	Retrievability – summary note for holistic assessment
2146	Implementing a partnership approach to radioactive waste management – Report to Government, April, 2007.
2213.1	Overseas Experience on Radioactive Waste Management. June, 2008
2266	CoRWM, 2008. CoRWM Work Programme 2008-2011.
2304	Note of meeting with members of Cumbrian councils, 13 February, 2008
2333	Note of meeting with COSLA, 25 April, 2008
2367	CoRWM Working Group A Commentary on DEFRA-NDA Documents relating to the Radioactive waste Inventory 2007, 30 May, 2008.
2385	Note of meeting with NuLeAF, 30 April, 2008
2406	Note of meeting with Department for Transport, 18 July 2008
2412	Meeting with NDA on risk management, 30 July 2008
2414	Note of meeting with OCNS, 23 July 2008
2420	Coherence and Co-ordination of Regulatory Processes. September 2008
2426	Funding Issues. August 2008.
2427	Note of Working Group A meeting with Professor Peter Styles (Chair, Criteria Proposals Group - CPG) and Professor Howard Wheater (Chair, Criteria Review Panel - CRP) on subsurface site exclusion criteria (SSEC), 26 August, 2008.
2431	Review of MRWS White Paper, September 2008.
2432	Note of meeting with Ynys Mon Council, 5 September, 2008
2436	Note of meeting with HSE Nuclear Directorate on waste storage, 3 September 2008
2438	CoRWM Comments on the UK Radioactive Waste Inventory 2007 and Proposal for an NDA 'Future Scenarios' Publication, October, 2008.

2446.1	Updated: Local Government responses to Chair letter about White Paper
2453	Note of meeting with NuLeAF, 17 July, 2008
2456	Note of WG-A and WG-C meeting with BGS, Keyworth, 26 September, 2008
2464	Note of meeting with EA and SEPA on waste conditioning, packaging and storage, 17 October 2008
2468	Note of workshop to brief Allerdale stakeholders on the MRWS process, 21 October, 2008
2472	The Disposal System Safety Case. NDA Presentation to CoRWM, 18 December 2008
2477	CoRWM's Response to the NDA's Consultation on a Framework for Sustainability and Environmental Assessment for Geological Disposal, November 2008
2479	CoRWM Response to NDA PSE Consultation
2482	Note of Working Group A meeting with Defra and DECC on the waste inventory, 3 December, 2008.
2484	Note of meeting on "Scientific issues involved in site selection and characterisation including application of exclusion criteria and views of geoscience community", held at The Geological Society, 13 November, 2008.
2488	CoRWM public and stakeholder workshop, Reading, 30 October 2008, Reading
2499	Note of meeting with Government, 3 November, 2008
2500	CoRWM Report to Government on Interim Storage of Higher Activity Wastes and the Management of Spent Fuels, Plutonium and Uranium, March 2009
2504	Note of meeting with Gwynedd County Council, 17 November, 2008
2511	Note of meeting with NuLeAF, 29 October, 2008
2525	Note of meeting of WG-A with Ground Forum on issues relating to MRWS stages 2, 4 and 5, 9 December, 2008.
2526	Implementing geological disposal – Working group A meeting with DECC & NDA, 8 December, 2008
2530	Meeting with COWAM In Practice, London, 13 January 2009
2534	Report on Overseas Experience: A progress report building on document 2213.1.
2543	CoRWM Report to Government on Research and Development for Interim Storage and Geological Disposal. (to be published October 2009)

2558	Decision Making and Responsibilities in the Implementation of Geological Disposal, March 2009.
2592	Log of Responses to Consultation on Full Draft of CoRWM's Geological Disposal Report, April-May 2009
2593	Report of CoRWM Stakeholder Workshop on Draft Geological Disposal Report, Workington, 15 May 2009
2596	Meeting of NuLeAF Steering Group, Maryport, 28 April 2009
2599	Meeting with NDA to Discuss Draft Geological Disposal Report and CoRWM 2009-10 Work Programme, Harwell, 11 May 2009
2604	Meeting of Copeland MRWS Partnership, Cleator, 14 May 2009
2605	Cumbrian Workshop Key Points, June 2009

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17 GLOSSARY AND ACRONYMS

Glossary of Terms

Notes

1. The Glossary defines terms in the way that CoRWM uses them. Differences from definitions given in publications by the Government, the regulators, the NDA and others are intentional.
2. Definitions are in normal text; additional comments and examples are in parentheses [ ] and italics.

Benefits Package	See "Community Benefits Package".
Call in	A term used in Town and Country Planning for those situations in which central government (the Secretary of State or devolved minister) decides to determine a planning application rather than leave it with the local planning authority.
Co-disposal	Generally, disposal of wastes with differing physical and chemical characteristics in the same facility. Now specifically used in the UK by Government, CoRWM and others to mean disposal of new build radioactive waste in the same facility as existing and "committed" radioactive waste. *[Often used in radioactive waste management literature to mean "co-location".]*
Co-location	Disposal of "high level waste", "intermediate level waste" and other types of "higher activity waste" in a combined "geological disposal facility" in which there are separate parts of the facility for the various types of waste. [*For example, there could be one part of the facility for intermediate level waste and another part for high level waste and "spent fuel".*]
Committed waste	Radioactive waste that will arise in future from the operation or decommissioning of existing nuclear facilities. [*As distinct from existing waste, which already exists, and new build waste, which will only arise if new facilities are built.]*
Community Benefits Package	A set of measures to enhance the social and economic well-being of a community that hosts a geological disposal facility, to recognise that the community is providing an essential service for the country.

Community Siting Partnership	A partnership of organisations with interests in the community that has expressed an interest in hosting a geological disposal facility. [*The partnership is expected to involve the host community, the "Decision Making Body" (or Bodies) and "Wider Local Interests". It will work with the Nuclear Decommissioning Authority and other relevant organisations to ensure local concerns are addressed during the geological disposal facility siting process and will advise the Decision Making Body (or Bodies).*]
Conditioning	Any process used to prepare waste for long-term storage and/or disposal. [*Usually by converting it into a suitable solid form e.g. incorporation in glass (vitrification), encapsulation in cement*.]
Decision Making Body	The Local Authority that will make the decisions for a host community in the geological disposal facility siting process.
Decision to Participate	A decision by a community to participate in the geological disposal facility siting process, without commitment to eventually host a facility.
Deep borehole disposal (DBD)	Disposal of waste in boreholes more than 1000m deep. [*Also known as very deep geological disposal and very deep disposal.*]
Desk-based studies	Review, summary, collation or evaluation of existing knowledge, information, facts and research outcomes. *[In the context of the UK geological disposal site selection process, assessing the suitability of sites using existing knowledge about the geology, surface environment, communities etc..]*
Development	Progressive, systematic use of knowledge and understanding gained from research directed towards the production or improvement of materials, devices, systems or methods. [*Includes the design and development of processes*.]
Disposal	Emplacement of waste in an appropriate facility without the intention of retrieving it. [*Retrieval may be possible but if intended, the appropriate term is "storage".*]
Engagement Package	Funding and other support given to a community that has made an "Expression of Interest" to assist it to consider the issues involved in geological disposal, including the setting up and running of a "Community Siting Partnership".
Environmental Safety Case	The collection of arguments, provided by the developer or operator of a disposal facility, that seeks to demonstrate that the required standard of environmental safety is achieved.

Expression of Interest	A notification to Government by a community that it is interested in entering discussions about involvement in the geological disposal facility siting process, without commitment.
Geological disposal	Generally, emplacement in the Earth's crust with no intent to retrieve. Used specifically in the MRWS programme and in this report to mean "disposal" of radioactive waste in an underground facility, where the geology (rock structure) provides a barrier against escape of radioactivity and where the depth, taken in the particular geological context, substantially protects the waste from disturbances arising at the surface.
Geological disposal concept	Any variant of geological disposal, including the use of a "mined repository", "deep boreholes" and more than one "geological disposal facility".
Geological disposal facility (GDF)	Any facility used for geological disposal. [*Includes mined repositories, natural caverns, disused man-made caverns or mines, and deep boreholes*.]
Geological disposal facility design	The detailed drawings and specifications that will allow construction of a "geological disposal facility". [*Includes nuclear, civil, mechanical, electrical, materials, chemical, geotechnical and geological engineering aspects.*]
Geological repository	See "Mined repository".
Higher activity waste (HAW)	Radioactive waste with activity above the thresholds for low level waste (LLW), *i.e.* above 4 GBq/tonne alpha activity or above 12 GBq/tonne beta gamma activity. [*It is usually also taken to include LLW unsuitable for near-surface disposal.*]
High level waste (HLW)	Radioactive waste in which the temperature may rise significantly as a result of its radioactive content, so that this factor has to be taken into account in the design of waste storage or disposal facilities. [*In practice, the term is only used in the UK for the nitric acid solutions arising from reprocessing spent fuels and for the vitrified form of the solutes in these solutions.*]
Host community	A community in which a geological disposal facility will be built. [*It is a community in a small geographically well-defined area, such as town or village, and includes the population of that area and the owners of the land.*]
Intergenerational equity	Balancing the needs of present and future generations.
Interim storage	Storage of radioactive waste prior to implementing a final management step, such as geological disposal.

Intermediate level waste (ILW)	Radioactive waste exceeding the upper activity boundaries for "low level waste" (*i.e.* over 4 GBq/tonne alpha activity or 12 GBq/tonne beta gamma activity) but having a low heat output that need not be taken into account in the design of storage or disposal facilities.
Legacy wastes	Radioactive waste that arose several decades ago. [*A subset of existing waste; sometimes called "historic waste" or "historical waste". The term is usually reserved for wastes kept in, or that have arisen in, old facilities.*]
Low level waste (LLW)	"Radioactive waste" with activity levels that do not exceed 4 GBq/tonne alpha activity or 12 GBq/tonne beta gamma activity. [*Subsets of LLW include "very low level waste" (VLLW) and exempt waste (i.e. "radioactive waste" with activity levels below those in the various Exemption Orders made under the Radioactive Substances Act).*]
Low Level Waste Repository (LLWR)	The UK national disposal facility for low level waste. [*Located near the village of Drigg in Cumbria.*]
Mined repository	A facility specifically constructed for the "geological disposal" of radioactive waste. ["*Mined and engineered repository" is a more correct description. Most designs consist of shafts or adits leading to tunnels and vaults*.]
Near-field	The part of a disposal facility near or in contact with the "waste packages", including filling or sealing materials and those parts of the host rock whose characteristics have been or could be altered as a result of the presence of the disposal facility and its contents.
Near-surface disposal	Disposal at or close to the surface of the Earth. [*It includes underground disposal in the Earth's crust at depths less than a few tens of metres, and emplacement in engineered structures at or just below ground level. Formerly called "shallow land burial" or emplacement in a "near surface repository".*]
Public	People who have no particular interest in, and are not affected by, radioactive waste management. [*CoRWM distinguishes between "stakeholders" and the public.*]

Radioactive waste	Radioactive waste is defined in the Radioactive Substances Act 1993. In essence, it is any substance for which there is no further use and in which artificial radionuclides are present at any level and/or natural radionuclides are present above the levels given in Schedule 1 of the Act. [*Note that spent fuels, plutonium and uranium are not radioactive wastes unless it has been decided that there is no further use for them and they are declared to be wastes*. *The Radioactive Substances Act definition of radioactive waste is under review and it is expected that a revised definition will be in place by April 2010*.]
Recoverability	The ability to remove wastes from a closed disposal facility by mining, drilling boreholes *etc*. [*Unlike "retrievability", recoverability does not entail the inclusion of any specific design features in a disposal facility.*]
Repository	A facility where waste is emplaced for disposal. [*Often used as shorthand for "mined repository", but also used in other contexts, e.g. the UK's Low Level Waste Repository (LLWR)*.]
Research	An investigation directed to the discovery of some fact or principle by a course of study or scientific enquiry.
Retrievability	An ability to withdraw wastes from a disposal facility that is achieved by means designed into the facility other than simply reversing waste emplacement. [*See also "reversibility" and "recoverability".*]
Reversibility	The ability to withdraw wastes from an open disposal facility by reversing the emplacement process.
Safety assessment	An assessment of whether a nuclear facility or operation is or, if particular actions are taken, will be safe.
Safety case	The complete set of arguments that demonstrates that a nuclear facility or operation is or, if particular actions are taken, will be safe.
Scientific research	The application of the scientific method to obtaining new information to explain the nature, properties or behaviour of something in the universe around us.
Spent fuel	Fuel that has been used in a nuclear reactor and for which there is no further use as fuel.
Stakeholder	A person or organisation who has an interest in or is affected by radioactive waste management. [*In the context of CoRWM's work, stakeholders include waste producers, regulators, non-governmental organisations, local authorities and communities near existing nuclear sites and potential disposal sites*.]

Stakeholder fatigue	A situation in which stakeholders are overwhelmed by communications and consultations on a particular topic, and do not respond to requests for their views.
Storage	Placing wastes or other materials in a facility with the intention of retrieving them at a later date.
Surface-based investigations	Investigations of a potential geological disposal site that are carried out from the surface, rather than underground. [*For example, seismic investigations and boreholes.*]
Very low level waste (VLLW)	Very low level radioactive waste (VLLW) is LLW that has radioactivity levels well below the maximum for the category. It can be disposed of with non-radioactive waste, rather than being placed in the Low Level Waste Repository or other specialised facility. [*There are two types of VLLW: low volume and high volume. Low volume VLLW is radioactive waste that can be disposed of safely to an unspecified destination with municipal, commercial or industrial waste (so-called "dustbin disposal"). It has an activity not exceeding 400 kBq in any 0.1m^3 and no individual item in the waste should have an activity above 40 kBq. These levels are increased by a factor of ten for tritium or carbon-14 (i.e. 4 MBq in 0.1m^3 and 400 kBq per item, where the limits apply to tritium and carbon-14 taken together). High volume VLLW is radioactive waste that can only be disposed of to a specified landfill site. Its activity level must not exceed 4 MBq/tonne or 40 MBq/tonne for tritium.*]
Voluntarism	An approach to siting geological disposal facilities that involves communities voluntarily expressing an interest in holding discussions with Government, then deciding whether to participate any further.
Waste package	A container and all its contents. [*Includes the waste, any encapsulating material, any capping grout, etc*.]
Wider Local Interests	Communities outside the "host community" that have an interest in the development of a geological disposal facility. [*For example, nearby villages, communities on transport routes to the "host community".*]

Acronyms

ALARA	as low as reasonably achievable
ALARP	as low as reasonably practicable
BAT	best available techniques
BERR	previously Department for Business, Enterprise and Regulatory Reform, now part of Department for Business, Innovation and Skills
BGS	British Geological Survey
BPEO	best practicable environmental option
CIP	COWAM in Practice (the latest phase of the COWAM project)
CoRWM	Committee on Radioactive Waste Management
CoSLA	Consortium of Scottish Local Authorities
COWAM	Community Waste Management (an EU project)
CSR	Comprehensive Spending Review
DBD	deep borehole disposal
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DoENI	Department of the Environment Northern Ireland
DSSC	disposal system safety case (being developed by NDA)
EA	Environment Agency for England and Wales
EHS	Environment and Heritage Service (of Northern Ireland, superseded by the Northern Ireland Environment Agency)
EIA	environmental impact assessment
EPP2	Environmental Permitting Programme, phase 2
EU	European Union
GDF	geological disposal facility

GDIB	Geological Disposal Implementation Board (a UK Government Group)
GRA	Guidance on Requirements for Authorisation (for disposal of solid radioactive wastes, produced by the environment agencies)
HLW	high level waste
HSE	Health and Safety Executive
ILW	intermediate level waste
IPC	Infrastructure Planning Commission
LLW	low level waste
LLWR	Low Level Waste Repository (near Drigg, in Cumbria)
LPA	Local Planning Authority
MoD	Ministry of Defence
MRWS	Managing Radioactive Waste Safely (the UK programme for the management of higher activity wastes)
MWDF	Minerals and Waste Development Framework
NAO	National Audit Office
NDA	Nuclear Decommissioning Authority
NGO	non-governmental organisation
NIEA	Northern Ireland Environment Agency
NII	Nuclear Installations Inspectorate (part of HSE)
NuLeAF	Nuclear Legacy Advisory Forum
OCNS	Office of Civil Nuclear Security (part of HSE)
OECD	Organisation for Economic Cooperation and Development
OPC	ordinary Portland cement
PIP	provisional implementation plan (the NDA plan for implementation of geological disposal)
PSE	public and stakeholder engagement
R&D	research and development

RWMD	Radioactive Waste Management Directorate (of the NDA)
SA	sustainability appraisal
SEA	strategic environmental assessment
SEPA	Scottish Environment Protection Agency
SF	spent fuel
SLC	site licence company (a company that runs an NDA site, under contract to the NDA, and holds the nuclear site licence)
SSEC	sub-surface exclusion criteria
SSG	Site Stakeholder Group (at NDA sites)
UKSO	United Kingdom Safeguards Office (part of HSE)
USDOE	United States Department of Energy
WAG	Welsh Assembly Government
WIPP	Waste Isolation Pilot Plant (a geological disposal facility in New Mexico, USA)
WMSG	Waste Management Steering Group (a UK Government Group)

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