

ISSUE SECTION Land Remediation and Particles	MARKING None	DOCUMENT REF: DEC(08)P166
Title: Strategy for Contaminated Land Management and Restoration 2008		Issue: 2.1
		Date: February 2009
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Purpose: For Committee Consideration and Approval		File No: D1073.05

SUMMARY

This document presents a strategy for contaminated land restoration to take the Dounreay site to 'Interim End State'. The strategy recognises that safe management of contaminated land prior to restoration is also essential. This document covers: the scope of contaminated land, stakeholders, goals, considerations affecting the strategy, details of strategy, and implementation of strategy. The appendix presents an interpretation of the current legislative requirements defining the end-state condition.

There are many drivers within the Dounreay plan and any one of them may take precedence over decisions to demolish and/or remediate a building footprint or area of contaminated ground. Restoration is planned early only where there is a clear driver, if there is a clear safety or environmental issue or when there is a land use requirement. In both of these cases an important consideration is the isolation or removal of upstream sources of potential recontamination.

The contaminated land strategy has been developed following discussion with decommissioning and waste management on hazard reduction and on the ability to manage waste volumes within the plan.

DEC is invited to approve this document to underpin the 2009 Lifetime Plan and for regulator consultation. The extended summary will be distributed to Dounreay Stakeholder Group.

Minor changes for clarification have made in Issue 2.1, following discussions with regulators and subsequent to DEC review.

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Issue	Date	Author Name Signature	Checked by Name Signature	Endorsed by Name Signature	Accepted by DEC
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Distribution:
Standard DEC

Extended Summary

Dounreay was built and operated as a nuclear reactor and nuclear fuel reprocessing experimental facility. The main purpose of the facility was to explore the feasibility of 'fast' reactors. The facility was constructed on the site of a former military airfield. Construction commenced in 1955, reactor operations ceased in 1994, fuel reprocessing ceased in 1996 and the last fuel element was manufactured in 2004. Since that time the only activity has been decommissioning.

The end-state for decommissioning was agreed as a result of public consultation in 2006. This end-state is planned to be achieved in three stages:

1. Decommissioning of most buildings and restoration of much of the site by c. 2025, so that release of some land for re-use is possible early. Some radioactive materials and wastes remain on site in temporary stores awaiting permanent storage/disposal;
2. Temporary stores are emptied and decommissioned, within a timescale of decades, subject to government decision, c.2076;
3. Radioactive decay over a few centuries completes the restoration of the site c. 2300, apart from any material in permanent stores or disposals.

Achieving the end-state will require a step-wise approach of facility decommissioning, site characterisation, remediation and restoration of contaminated land. Prior to restoration, contaminated land must be managed safely.

This document is one of a suite of documents describing how this agreed end-state will be achieved. It sets out the strategy for contaminated land restoration and the management of contaminated land until such time as restoration is practicable. Management will include characterisation and remediation activities associated with new construction to enable overall site decommissioning. This strategy derives from and replaces the previous Strategy for Contaminated Land Management and Restoration 2007 (DEC(07)P116). It serves to communicate the Strategy for Contaminated Land Management and Restoration to key stakeholders, perceived to be:

- The UK Government and Scottish Government;
- Dounreay's client – the Nuclear Decommissioning Authority;
- Dounreay's regulators – the Nuclear Installations Inspectorate, Scottish Environment Protection Agency, The Highland Council;
- Other interested parties, including the general public via the Dounreay Stakeholders' Group.

The development and implementation of the strategy is discussed regularly with regulators. The plan is to update non-regulatory stakeholders annually. Since the overall objective of the contaminated land management process has been agreed with stakeholders, the plan is not to consult further on either day-to-day operations or on detailed technical matters. We will involve non-technical stakeholders in issues where there is a clear public interest, without generating an excessive burden of frequent consultation on technical issues of limited public interest. Where possible we will advise non-technical stakeholders in advance of possible consultations.

This strategy covers all land within and outwith the Dounreay nuclear licensed site containing chemical and/or radioactive contamination as a result of the activities of UKAEA Dounreay and previous occupants of the area of the currently licensed site, except for authorised disposals to ground (the existing Low Level Waste Pits complex, the Shaft and Landfill 42 to the east of the site). Historically contaminated land downstream from authorised disposal facilities to ground is covered by this strategy, as are disposals of waste that pre-date or are otherwise outwith the modern waste disposal authorisation regime. The majority of the land concerned lies within the licensed site and in the narrow strip of land to the north, between the site and high water, see Figure 1. For clarity, this excludes Vulcan and the Scottish and Southern Electricity substation (outside Nuclear Decommissioning Authority's remit). Buildings are included only from the floor-slab down, and infrastructure other than the Low Active Drain duct is not within the remit of this strategy. The particles in the marine environment are covered by a separate strategy, also agreed by public consultation.

The goals of the strategy are:

1. The contracted end state, agreed as the result of public consultation, will be achieved;
2. Current regulatory requirements will be complied with, including safety and environmental requirements;
3. The target criteria will be achieved. These are based on reducing risk to an acceptable level, as defined in regulatory guidance. These criteria may incorporate some restriction on use, including both administrative and physical restrictions;
4. Adequate records of land condition and how it has been achieved will be maintained;
5. Environmental emissions and radiological risk during and after restoration will be maintained As Low As Reasonably Practicable, without incurring costs disproportionate to benefit;
6. Generation of new contaminated land will be avoided and the spread of existing contamination will be minimised;
7. The excavation of contaminated material will be avoided where a case can be made that end state requirements can be met if it remains in place;
8. The amount of material from decommissioning that is used in restoration will be maximised;
9. Export of wastes for disposal will be minimised, by avoiding excavation where possible and by reducing the volume and categorisation of waste by segregation;
10. The overall cost and duration of land restoration will be minimised, subject to other constraints;
11. The strategy seeks to result in progressive reduction of risk towards the end-state goal, without re-work. Where possible, the final end state goal as currently defined for contaminated land, will be achieved by first interim state (c. 2025);
12. We will seek to avoid interventions where there is an environmental or social cost without an overall reduction in risk from contamination;
13. We will seek to improve the strategy (reduce environmental/safety risk, timescale, cost).

There are six key elements to the restoration strategy;

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1. Investigation and assessment of the actual condition of potentially contaminated land;

2. Safe management (health and environment) of contaminated land *in situ* in compliance with the statutory regime, where early restoration is not possible or is disadvantageous;
3. Remediation of areas where the nature and/or quantity of contamination are such as to adversely affect the making of a closure environmental/safety case i.e. meeting the end state;
4. Restoration of areas where residual contamination remains after remediation, to meet appropriate end-states. The final stage of restoration is likely to be the covering of areas where residual contamination remains with a layer of clean material up to two metres thick. The final surface will be vegetated where not in use by buildings.;
5. Verification and monitoring during and after restoration to assess conformance with environmental and safety expectations. This verification will include complete monitoring of the accessible surface of the restored area, to demonstrate the absence of unacceptable radioactivity;
6. Generation of records of land quality throughout the period of decommissioning and restoration, to confirm achievement of restoration objectives.

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Restoration and management comprise the sum of these elements – all are necessary.

Within this top level strategy, lower level strategies are expected to be developed for particular areas of the site, or particular facilities. These will contain more detail and will drive the tactics for specific activities.

The execution of the project is programmed via the Lifetime Plan, approved each year by the Nuclear Decommissioning Authority. Progress to date with characterisation is shown in Figure 2.

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Various materials will be produced from land remediation activities, some of which will be surplus to requirement or unsuitable for re-use, and which therefore will become waste. Other material is potentially re-usable.

For materials that are waste, disposal routes are expected to be as documented in Table 1 (soil is used here in the engineering sense and includes soil, sub-soil, broken rock, demolition concrete, etc)

Table 1 - Waste disposal routes

Material	Route
Low Level Waste soil etc (activity higher than is consistent with end-state), non-hazardous.	For disposal at proposed Dounreay Low Level Waste repository.
Low Level Waste soil etc (activity higher than is consistent with end-state), chemically hazardous. (defined as inconsistent with LLW repository concept)	Pre-treated in dedicated on-site facility to a form consistent with disposal at the proposed Dounreay Low Level Waste repository.

Material	Route
Chemically hazardous waste soil etc, clean or exempt	Pre-treated on-site for disposal off-site as exempt hazardous waste, using a facility distinct from the Low Level Waste facility, unless treatment achieves a sufficiently high standard that the material can be re-used on site.
Operational wastes.	Segregated for disposal via authorised routes.

A preliminary comparison of the volume of material needed for void-fill and restoration, with the volume of material from demolition and surplus from the Low Level Waste repository construction, indicates an approximate balance. There is no overall surplus material and therefore it is important that these materials are re-used. This will minimise the disposal of waste from the site during decommissioning, and also minimise the need to import material for site restoration. A protocol for this is still to be agreed with regulators.

The feasibility of the strategy is conditional on the correctness of a number of assumptions:

- The framework of legislation, statutory and non-statutory guidance is as at 30 September 2008. There is no change in the regulations or adverse change in their interpretation;
- A repository for Low Level Waste in the vicinity of Dounreay will be available c. 2015;
- Material that has been demonstrated to be free of radioactive contamination by high confidence monitoring can be managed as 'effectively clean'*;
- A process can be agreed with regulators whereby available surplus materials from decommissioning and Low Level Waste repository construction can be used for site restoration;
- A viable soil-sorting technology can be developed;
- Void filling with radioactive wastes below a certain activity will be authorised;
- Leaving residual radioactive contamination in the ground will be permitted by regulators, either authorised or agreed to be outwith the scope of authorisation, but subject to a satisfactory safety case being made.
- Contamination will not be pursued into rock.
- It is assumed that a disposal route can be found for all wastes that are generated.

* This expression differs from the expression 'clean' used in the Nuclear Industry Code of Practice on Clearance and Exemption Principles. The latter expression is reserved for material whose provenance is such that it can never have been contaminated.

- Having made investigations, it is assumed that there is no remaining liability for contamination beyond the licensed site, other than the strip of land between the northern perimeter of the site and the North Atlantic Ocean.

Figure 1 Extent of liability within scope of Contaminated Land Strategy

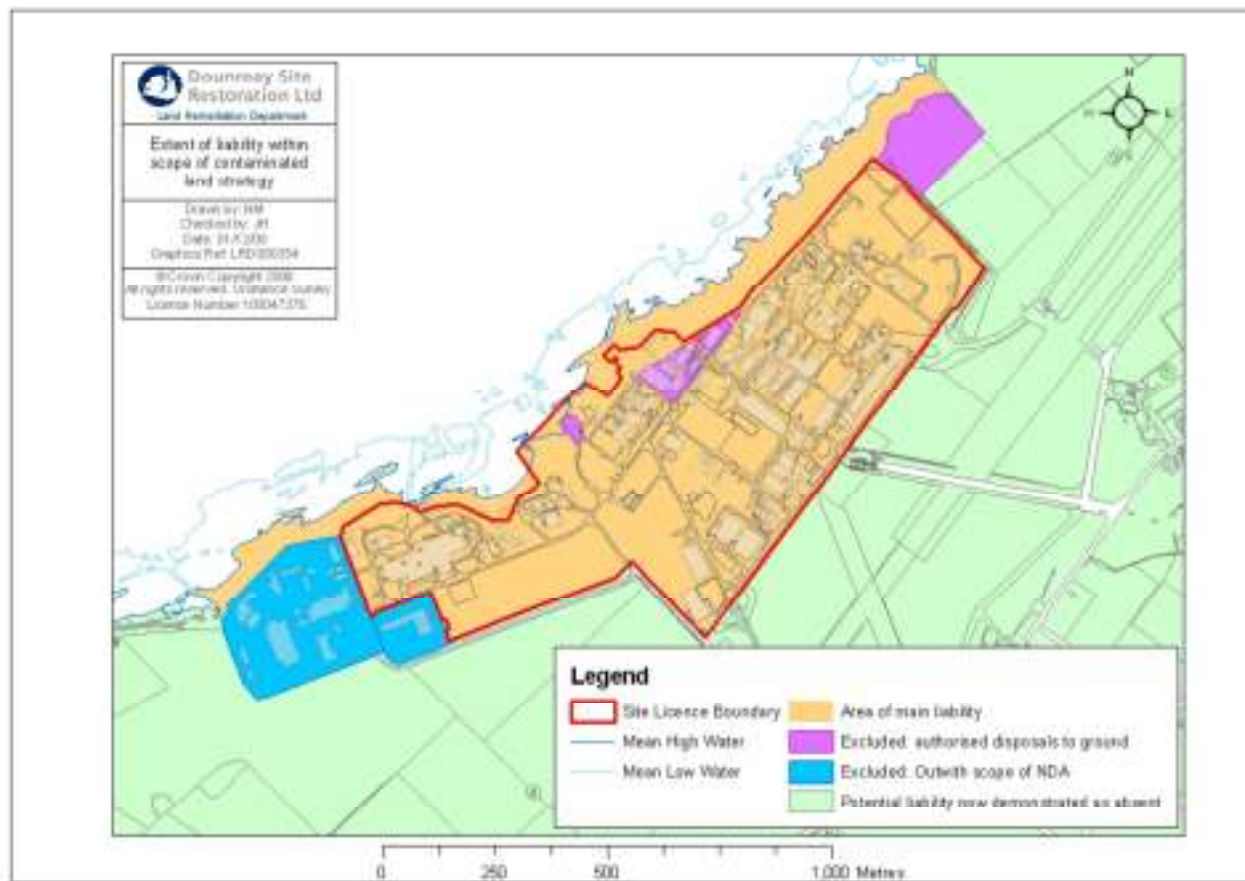


Figure 2 Contaminated land intrusive characterisation progress October 2008

