

## **New LLW Facilities Project – Stage 2**

### **Position Paper on Why the Proposed New Facilities are not on the Existing Licensed Site**

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#### **Introduction**

- 1 UKAEA has undertaken a transparent and consultative site selection process resulting in the decision to submit a planning application for new LLW disposal facilities on a site adjacent to the eastern boundary of the existing Dounreay nuclear licensed site. The proposed facilities consist of a series of six below-ground concrete vaults, required to enable the decommissioning and restoration of the Dounreay site.
- 2 Recent site characterisation work<sup>1</sup> has better defined the exact location of major faulting in the local area and has led to a refinement of the preferred site location and layout, as shown in Figure 1.
- 3 UKAEA has consulted widely on the proposals, both in the Best Practicable Environmental Option (BPEO) selection stage<sup>2</sup> and during the subsequent preparation of the planning application and its associated Environmental Statement<sup>3</sup>. Some stakeholder views that have arisen during this process have influenced the specific choice of location on UKAEA-owned land<sup>4</sup> at Dounreay:
  - (i) The facilities should be on or close to the existing Dounreay nuclear licensed site so as to minimise the spread of the site footprint.
  - (ii) The facilities should not be visually intrusive.
  - (iii) More emphasis should be put on the impacts of the facilities during construction and operation, rather than focusing on long-term (post-closure) safety<sup>5</sup>.
- 4 This note specifically addresses why the proposed new LLW facilities have not been put on the existing licensed site, which is an issue raised by some local stakeholders. UKAEA recognises that in terms of planning issues, the existing licensed site would offer a brownfield location for the development, would minimise the spread of the Dounreay footprint, and would align with many stakeholders' views that, if possible, the development should be on the existing site. However, there are several reasons why UKAEA does not regard the existing site as a viable solution.

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<sup>1</sup> LLW(07) S2/186, August 2007 - Dounreay New LLW Facilities Site Characteristics and Site Characterisation Plan 2007

<sup>2</sup> GNGL(04)TR75 April 2004 - Dounreay LLW Strategy Development - Best Practicable Environmental Option Study - Final report -

<sup>3</sup> LLW(06)S2/61 March 2006 - New LLW Facilities Project – Stage 2 – Environmental Statement

<sup>4</sup> The land was UKAEA owned during the consultation and this is how it is referred to but ownership has recently transferred to the Nuclear Decommissioning Authority

<sup>5</sup> This statement recognised the relatively low hazard from LLW in the long-term due to radioactive decay.

## Why the selected area was chosen

- 5 Details of the site selection process are documented in two reports<sup>6</sup> and a companion paper to this one<sup>7</sup>. This work recognised that the optimum location for the new LLW facilities would be on the existing licensed site if suitable space were available. However, suitable space is not available on site. The majority of the Dounreay licensed site lies within the zone categorised as potentially susceptible to coastal erosion and inundation from future sea-level rise in the next 10,000 years (shown as the area seaward of the red line in Figure 2). The reasoning behind using this line as a site selection objective is discussed in separate papers.<sup>8</sup> The main reason that the majority of the existing licensed site is seaward of that line is due to predicted sea-level rise over the next few thousand years. Most of the existing licensed site is relatively low lying and therefore susceptible to sea-level rise.
- 6 UKAEA understands that siting new LLW disposal facilities in a location that is likely to be eroded owing to sea-level rise and coastal erosion in the next few thousand years, while the alpha activity in the vaults is greater than background levels of alpha activity in Dounreay soils, would be unlikely to be seen by the Scottish Environment Protection Agency (SEPA) as representing Best Practicable Means (BPM). Such a proposal would therefore be unlikely to receive an authorisation from the SEPA.
- 7 The small area on the existing licensed site situated to the south of this siting objective (the red line in Figure 2) is not a practicable option for the new facilities for two main reasons:
- (i) There are existing facilities and services within the area that will remain operational until close to the end of site decommissioning. It would be extremely difficult to work around these facilities and services and to do so safely.
  - (ii) From existing site characterisation information, it is known that the two major faults in this area – the Geodh nam Fitheach Fault and the Dog Track Fault - converge around the southeast corner of the licensed site (Figure 3). There is significant uncertainty concerning the detailed structure of the bedrock in this area, and it is likely to be an area of particularly intense faulting. UKAEA considers it prudent to avoid siting the facilities on areas of intense faulting, owing to the potential for increased water flows relative to the surrounding rock mass and the potential of faults to act as conduits for upward water flows. Both of these could have a negative impact on ease of construction and operation, and on long-term safety.
- 8 There are several more detailed reasons why UKAEA believes the chosen area is more suitable than the on-site area: these relate to near-surface hydrogeology, site characterisation, and construction.

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<sup>6</sup> LLW(06)S2/55 March 2006 – LLW Facilities Stage 2 Site Selection Paper & LLW(06)S2/60 March 2006 – LLW Facilities Site Selection Workshop Record January 2006

<sup>7</sup> LLW(07)S2/243 Issue 1, March 2008 – New LLW Facilities Project – Stage 2: Position Paper on Selection of the Proposed Location

<sup>8</sup> LLW(07)S2/195 Issue 1, March 2008 – New LLW Facilities Project – Stage 2: Position Paper on Climate Change and its Impacts & LLW(07)S2/243 Issue 1, March 2008 – New LLW Facilities Project – Stage 2: Position Paper on Selection of the Proposed Location

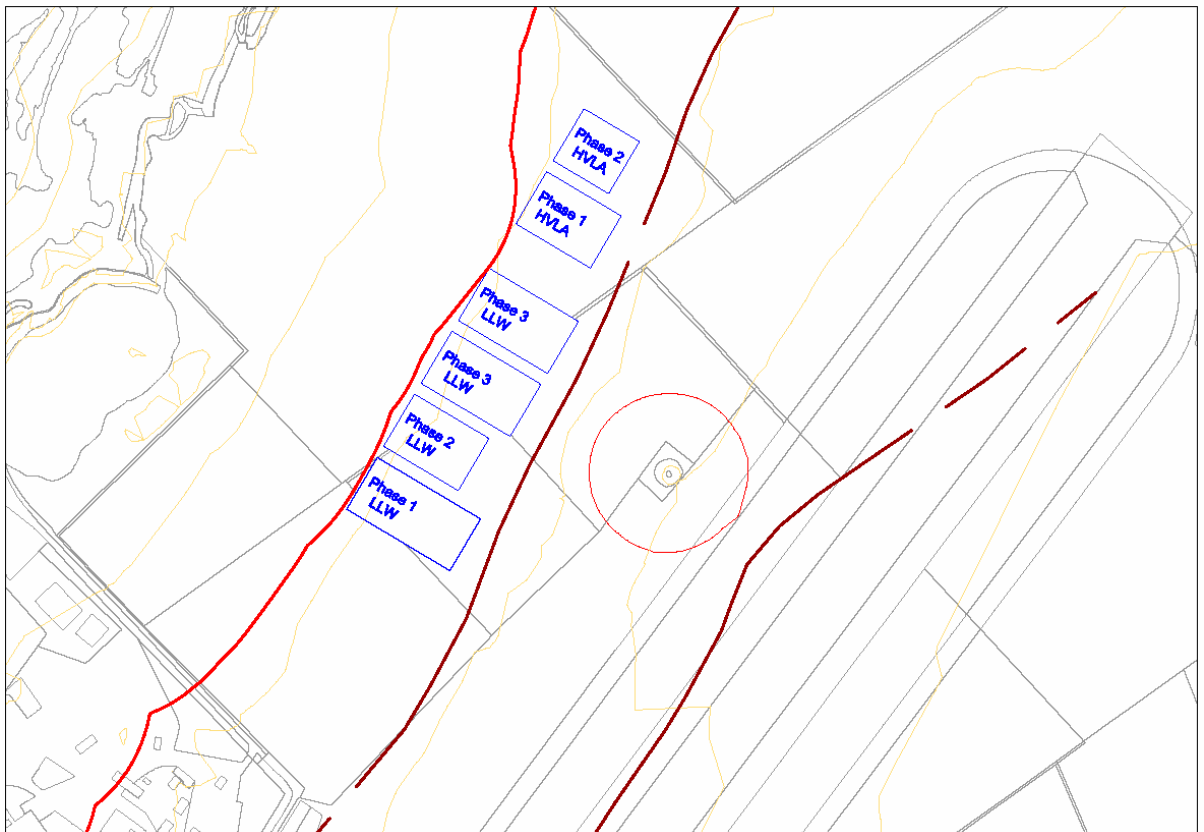
- 9 *Near-surface hydrogeology.* The near-surface hydrogeology on the site is complex owing to site construction activities that have occurred in the past. In addition, the favourable natural layer of low-permeability till found in the off-site location in the upper few metres of the ground has been disrupted throughout the on-site area by construction of roads, buildings and services. This till layer acts to minimise vertical groundwater flows and is beneficial in demonstrating the long-term safety of the proposed new LLW facilities.
- 10 *Site characterisation.* Site characterisation investigations are required to support the long-term safety case that must be made for the proposed new facilities to meet regulatory requirements. Carrying out site characterisation investigations would be extremely difficult on site owing to the presence of buildings, roads and services. Subsequent interpretation of the investigation findings would also be difficult, owing to the man-made features near the surface and the major faults in this area. In contrast, the chosen location immediately adjacent to the east side of the licensed site is relatively open, with good access, and the area is relatively undisturbed by other activities. This allows easier access for site investigations and easier interpretation of site characterisation data.
- 11 *Construction.* Constructing engineered disposal vaults on the licensed site would be severely constrained by interactions with existing operational buildings and services. The presence of contaminated ground in the area would complicate construction and lead to additional waste generation. The selection of the southeast corner of the licensed site for any phase of vault construction would lead to increased project costs, increased project timescales and increased risk of failure to deliver the programme. In contrast, the chosen location is relatively free of services, free from contamination, and is currently under agricultural use. Vault construction in this area would be a relatively straightforward task.
- 12 Constructing the vaults on site offers no significant advantages other than UKAEA being able to state that it is not spreading the footprint of the existing licensed site. The disadvantages are significant. The key issues are summarised in Table 1.

## Summary

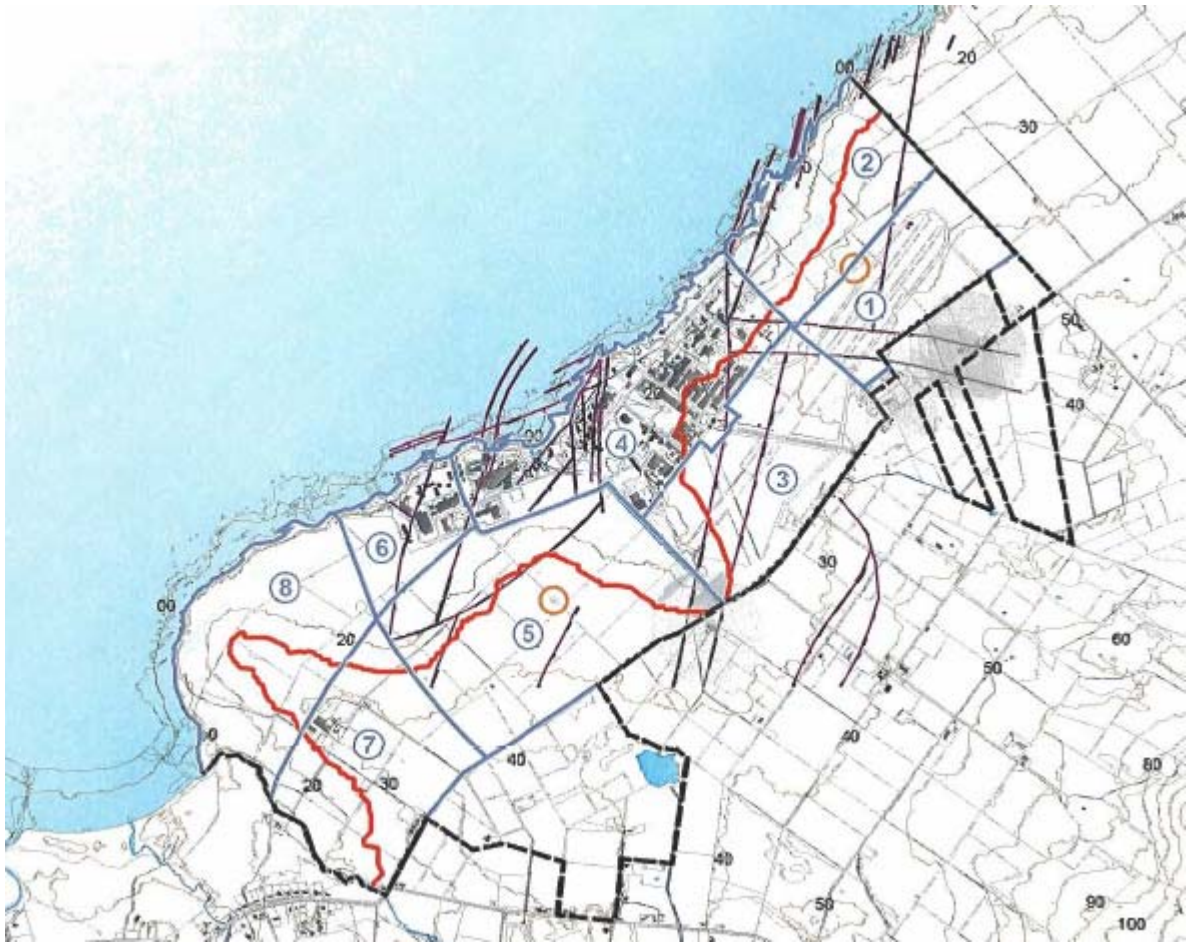
- 13 UKAEA has assessed the different areas of UKAEA-owned land at Dounreay in an open and transparent manner, and has selected an optimum location for the construction of the new LLW disposal facilities. The selected location is land adjacent to the east side of the existing licensed site. UKAEA believes it has characterised this area sufficiently to demonstrate its suitability as a location.
- 14 There is insufficient suitable space to site the vaults on the existing licensed site. The only area to the south of the zone regarded as susceptible to coastal erosion and sea-level rise in the next 10,000 years is the southeast corner of the licensed site. The convergence of major faults in this area, combined with the presence of operational facilities and services, results in this area not being regarded as a practicable location for construction of any of the new LLW vaults. There are several more detailed factors outlined in this paper that would add to the difficulty in investigating,

planning, constructing and authorising new disposal facilities in the southeast corner of the existing licensed site, compared to the chosen location to the east of the licensed site.

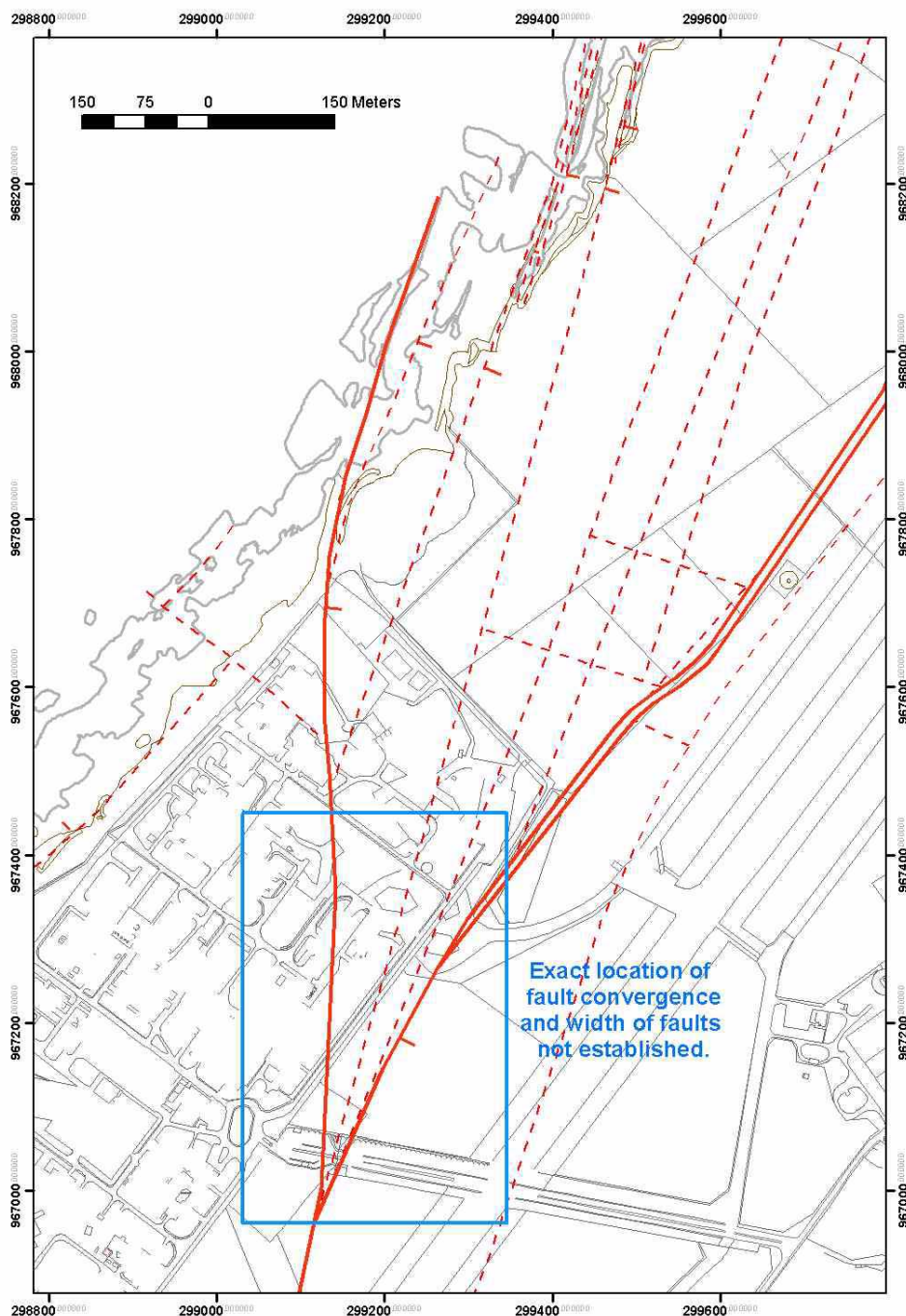
- 15 The chosen location adjacent to the east side of the existing licensed site is believed to achieve a balanced compromise between various physical constraints and a range of environmental and stakeholder issues. It minimises the spread of the Dounreay footprint, lies as close to the existing site and as far from nearest neighbours as is practical, and is visually unobtrusive. Some stakeholders may view an on-site location as preferable, but it offers no physical advantages over the chosen location and has numerous significant disadvantages.



**Figure 1. Layout of the proposed new facilities with respect to significant siting features. The Figure represents approximately 950 m (west-east) by 850 m (north-south). The red line represents 100 m inland of the 20 m AOD contour to allow for future sea-level rise and coastal erosion. The brown lines indicate the approximate north-western and south-eastern edges of the Geodh nam Fitheach Fault Zone. The red circle represents a 50-m exclusion area around a chambered cairn. The south-eastern corner of the existing licensed site is seen in the south-western part of the Figure.**



**Figure 2. Areas (circled numbers 1 to 8) on UKAEA-owned land at Dounreay considered in selecting sites for the proposed new LLW disposal facilities. Also shown is the red line used as a siting objective to avoid areas that could be affected by future sea-level rise and coastal erosion over 10,000 years.**



**Figure 3. Structural interpretation of the Devonian bedrock in the Dounreay area, showing the convergence of major fault zones in the southeast corner of the licensed site. Exact location and width of convergence zone has not been established.**

**Table 1. Comparison of on-site location and chosen location for siting proposed new LLW disposal facilities.**

<b>Issue</b>	<b>Southeast corner of licensed site</b>	<b>Chosen location - Area 2</b>
Availability of area of sufficient size	The presence of operational facilities does not allow sufficient area for construction of proposed vaults.	There is sufficient open ground to site the facilities.
Geology - bedrock	Major faults in bedrock converge in this area and vaults constructed in this area would have to be located on those faults.	There is sufficient space available to avoid construction on major faults.
Geology – superfcials (upper few metres)	The near-surface geology has been disrupted throughout the area by construction processes – building foundations, roads and services. The near-surface geology would be extremely difficult to characterise and model.	Relatively uniform sequence of superficial deposits over the area. Presence of a widespread low-permeability till layer overlying bedrock has positive characteristics in terms of limiting vertical water flows.
Hydrogeology	Difficult to characterise and model with the presence of converging major faults. Believed to be increased potential for upwards migration of groundwater - there are positive heads at depth further west on the Dounreay site.	Believed to be a good area in terms of likely hydrogeology to be found at Dounreay. Evidence of less potential for upwards migration of groundwater through avoiding construction on major faults. Evidence for more neutral heads at depth in this area.
Site characterisation	The presence of buildings, roads and services, as well as ongoing decommissioning work, combined with the presence of major faults in the underlying bedrock, would make the task of characterising the area extremely difficult, both in carrying out the physical investigation work and the subsequent interpretation and modelling of the findings. This could significantly delay the programme (see below).	The area is relatively open with good access for carrying out investigations of the area. The relatively undisturbed geology makes interpretation of the investigation findings a more straightforward task.
Construction	<p>For the vaults to be built on site, operating facilities and services would have to be relocated. This is not regarded as a credible option in terms of the scale of that work and in terms of cost and programme delays.</p> <p>Even if there were physical space available, the complexity of the area generally would lead to delay in the programme and a significant increase in project costs. Safety issues and impacts on other facilities would arise from construction activities on this already busy area, with many other facilities, services and projects operating in close proximity on the same timescale. Dealing with contaminated ground, diversion of services, and location of faults would make construction of the vaults significantly more difficult.</p>	Area relatively free of services; agricultural use currently. In relative terms, the construction task is straightforward.

<b>Issue</b>	<b>Southeast corner of licensed site</b>	<b>Chosen location - Area 2</b>
Waste generation	<p>There are known areas of contaminated ground and this would lead to large volumes of excavated material needing to be re-disposed as waste. Soils and building foundations which could otherwise safely remain in place, once excavated, have to be treated as waste.</p> <p>Would be difficulty in demonstrating the contaminated groundwater would not be pulled towards the facilities from known contamination and would give rise to a significant waste handling issue if it were to occur.</p>	<p>Area shown to be free from significant levels of contamination.</p> <p>Potential interaction with Landfill 42, but anticipated to be minimal and easily addressed.</p>
Project timeline, costs and risk	<p>Owing to the increased complexity of the area, more characterisation work would be needed to develop a sufficient geological and hydrogeological understanding. The general complexity of the area would lead to a delay in programme and a significant increase in project costs. The increased difficulty with characterisation and construction make this location very high risk in terms of project delivery.</p>	<p>The selected location is the best practicable location on UKAEA-owned land at Dounreay, selected through a balanced assessment of options. The hydrogeological suitability has been confirmed during site characterisation.</p>
Distance from neighbours	<p>This area is a similar distance from the nearest neighbour as the chosen location.</p>	<p>Similar distance from nearest neighbour as the southeast corner of the licensed site.</p>
Visual impact	<p>Location is generally visible and can be seen from main road and nearest houses, but has the backdrop of an industrial site.</p>	<p>Location can only be seen in the distance from the west, with a foreground of an industrial site.</p>
Distance from existing licensed site	<p>Location is on the current licensed site.</p>	<p>Location is immediately adjacent to the existing licensed site and represents a minimal spread of the Dounreay footprint.</p>