

WASTE STREAM	5B343	Other Facilities Decommissioning LLW
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SITE Dounreay

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE LLW

WASTE VOLUMES

Stocks:
Future arisings:

	Reported (m ³)
At 1.4.2025	= 0
1.4.2025 - 31.3.2026	= 27.7
1.4.2026 - 31.3.2027	< 0.1
1.4.2028 - 31.3.2029	= 44.1
1.4.2029 - 31.3.2030	= 48.5
1.4.2033 - 31.3.2034	= 19.1
1.4.2034 - 31.3.2035	= 79.7
1.4.2035 - 31.3.2036	= 41.6
1.4.2045 - 31.3.2046	= 6.4
1.4.2046 - 31.3.2047	= 0.9
1.4.2047 - 31.3.2048	= 0.4
1.4.2050 - 31.3.2051	= 211.6
1.4.2064 - 31.3.2065	= 13.1
1.4.2065 - 31.3.2066	= 13.9
1.4.2066 - 31.3.2067	= 13.9
1.4.2067 - 31.3.2068	= 13.9
1.4.2068 - 31.3.2069	= 1.5
1.4.2069 - 31.3.2070	< 0.1
1.4.2071 - 31.3.2072	= 7.4
1.4.2072 - 31.3.2073	= 22.5
1.4.2073 - 31.3.2074	= 13.1
1.4.2074 - 31.3.2075	= 113.4
1.4.2075 - 31.3.2076	= 335.5
1.4.2076 - 31.3.2077	< 0.1
1.4.2077 - 31.3.2078	= 0.1
1.4.2078 - 31.3.2079	= 0.2

OR

Conditioned (m ³)	Packaged (m ³)

Total future arisings: **1028.8**
Total waste volume: **1028.8**

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: Programme data is based on Life Time Plan 2024 dataset generated in December 2023.

Additional information on quantities: These wastes arise from the decommissioning of a variety of facilities.

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 1.20
Stock (lower): x - Arisings (lower): x 0.80

WASTE SOURCE Decommissioning of a range of active facilities.

PHYSICAL CHARACTERISTICS

General description: Plant equipment, pipework, ducting and structures. Items will be size reduced where practicable during decommissioning.

Changes since waste generated: -

Bulk density (t/m³): = 0.60

Comment on density: Based on actuals data from Dounreay's waste consignment system. Data considered acceptable for 2025 submission.

CHEMICAL COMPOSITION

General description and components (%wt): Aluminium (0.05%), Asphalt (TR), Brick/Rubble (19.05%), Cementitious material (e.g. concrete) (56.13%), Ceramics (TR), Glass (0.03%), Mild Steel (10.76%), Other (TR), Other metal (TR), Other organics (TR), Paper (0.03%), Plastic (0.79%), Rubber (0.11%), Sources (TR), Stainless steel (12.50%), Sweepings (0.42%), WEEE containing hazardous components (0.03%), WEEE not containing hazardous components (0.01%), Wood/ Wood composite (0.07%).

Chemical state: Neutral

Sheet metal proportion / thickness: 45.78% by wt of all metals will be sheet from ventilation and ducting. Assumed sheet metal thickness is of a range between 1.6-2.5mm.
25.42% by wt of all metals will be bulk from tanks and gloveboxes.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 12.5	Assumed M316	
Other ferrous metals.....	= 10.8	Ferrous metals includes mild steel, proportions unknown at present.	
Iron.....	= 0	-	
Aluminium.....	= 0.05	-	
Beryllium.....	= 0	-	
Cobalt.....	= 0	-	
Copper.....	= 0	-	
Lead.....	= 0	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	= 0	-	
Titanium.....	= 0	-	
Uranium.....	= 0	-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	= 0.05	Other metal TR, Sources 0.01%, WEEE containing hazardous components 0.03%, WEEE not containing hazardous components 0.01%	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	= 0.11	-	
Paper, cotton.....	= 0.03	-	
Wood.....	= 0.07	-	
Halogenated plastics.....	= 0.40	-	
Total non-halogenated plastics.....	= 0.40	-	
Condensation polymers.....	NE	-	
Others.....	NE	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	= 0.11	-	
Halogenated rubber.....	NE	-	
Non-halogenated rubber.....	NE	-	
Hydrocarbons.....	< 0.01	-	
Oil or grease.....	= 0	-	
Fuel.....	NE	-	
Asphalt/Tarmac (cont.coal tar).....	= 0	-	
Asphalt/Tarmac (no coal tar).....	< 0.01	-	
Bitumen.....	= 0	-	
Others.....	NE	-	
Other organics.....	TR 0.01	Other organics 0.01%, Other TR	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 19.1	-	
Cementitious material.....	= 56.1	-	
Sand.....	= 0	-	
Glass/Ceramics.....	= 0.03	Ceramics TR, Glass 0.03%	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	= 0	-	
Asbestos.....	= 0	-	
Non/low friable.....	NE	-	
Moderately friable.....	NE	-	
Highly friable.....	NE	-	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 0.42	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	= 0	-
Chloride.....	NE	-
Iodide.....	NE	-
Cyanide.....	= 0	-
Carbonate.....	NE	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	= 0	-
Sulphate.....	= 0	-
Sulphide.....	NE	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	= 0	-
Low flash point liquids.....	= 0	-
Explosive materials.....	= 0	-
Phosphorus.....	= 0	-
Hydrides.....	= 0	-
Biological etc. materials.....	= 0	-
Biodegradable materials.....	= 0	-
Putrescible wastes.....	NE	-
Non-putrescible wastes.....	NE	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	= 0	-
Higher activity particles.....	NE	-
Soluble solids as bulk chemical compounds.....	= 0	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	= 0	-
Benzene.....	NE	-
Chlorinated solvents.....	= 0	-
Formaldehyde.....	= 0	-
Organometallics.....	= 0	-
Phenol.....	NE	-
Styrene.....	= 0	-
Tri-butyl phosphate.....	NE	-
Other organophosphates.....	= 0	-
Vinyl chloride.....	NE	-
Arsenic.....	NE	-
Barium.....	= 0	-
Boron.....	NE	-
Boron (in Boral).....	NE	-
Boron (non-Boral).....	NE	-
Cadmium.....	NE	-
Caesium.....	= 0	-
Selenium.....	NE	-
Chromium.....	NE	-
Molybdenum.....	NE	-
Thallium.....	= 0	-
Tin.....	NE	-
Vanadium.....	NE	-
Mercury compounds.....	= 0	-
Others.....	NE	-

Complexing agents (%wt):

Yes		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	TR	Decontamination agents likely to be present in trace amounts.
Total complexing agents.....	TR	-

Physical components:

	Number	Type(s) and comment
Sources.....	> 100	498 Sources in total. Mixture of solid and liquid sources.
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....	-	-
EEE Type 2.....	= 11	Drying Oven, Glass Sample Enclosure, Pump, Glovebox, Frisking Probe, Hand and Foot Monitor, Thermo Scientific Mobile Aerosol Monitor FHT 58L Fed Via Isolator GID6/1, Air Sampler
EEE Type 3.....	= 10	Vacuum Cleaners
EEE Type 4.....	= 1	Lamp
EEE Type 5.....	-	-

Planned on-site / off-site treatment(s):

Comments on planned treatments:

4% of the waste stream will be supercompacted in 200L drums before being placed in HHISOs. HHISOs filled with bulk waste, compacted drums, or a mix of both will be encapsulated before final disposal.

For LLW, waste will be grouted into non IP rated HHISOs through a dedicated grouting facility.

Plant Name	Location

Non-standard

NRS Dounreay uses 3:1 PFA: OPC ~35% water content and plasticiser.

Likely container type:

Range in container waste loading:

The waste loading value is a rough average using previously consigned waste data. Waste loading per ISO can vary significantly, based on how the container is loaded. In general, bulk items lead to a lower waste loading value whereas compactable items lead to a higher one. Most containers contain a mix of the two.

The waste will consist of large uncompactable items and 200 litre drums that have already been compacted. The waste will be loaded into alternative non-IP2 rated LLW Disposal HHISO for transfer to the DSRL LLW Disposal Facility. Each HHISO may have other LLW items in the final HHISO.

~ 2.0

This value is the midpoint between a range of densities going from 1.49-2.47. These were taken from HHISOs disposed of in NRSD LLW Disposal Vaults.

Disposal Route	Stream volume %	Raw density t/m ³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	= 100.0		
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility:

Opportunities for alternative disposal routing: Yes

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
Dounreay LLWDV	Metal treatment facility	~ 8.0	GREEN	Trials have progressed to open the Metal Treatment Route. It is expected that the waste route will open in 2025. The metallic waste treatment route 8% remains indicative and is subject to further review and characterisation by NRS Dounreay.
Dounreay LLWDV	Incineration facility	= 4.0	GREEN	This opportunity is still at an early stage of development. A small scale trial has taken place. This can potentially divert up to all compactable LLW. The incinerables waste route 4% is theoretical maximum based on 100% drummed LLW being suitable for incineration. The 4% is subject to further review by NRS Dounreay.

RADIOACTIVITY

Source: The radioactivity arises from contamination of a range of active facilities.

Uncertainty: Best estimate available, within a factor of 10 for arisings.

Measurement of radioactivities: Based on consignor's records on Data Management System.

Chemical form of radionuclides:

- H-3: Likely to be present at low concentrations.
- C-14: Likely to be present at low concentrations.
- Cl-36: Unlikely to be present.
- Se-79: Likely to be present at low concentrations.
- Tc-99: Likely to be present at low concentrations.
- I-129: Likely to be present at low concentrations.
- Ra: Likely to be present at low concentrations.
- Th: Likely to be present at low concentrations.
- U: Likely to be present as oxide, nitrate and metal.
- Np: Likely to be present at low concentrations.
- Pu: Likely to be present as oxide or nitrate.

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Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3			= 5.00E-10	C C 2	Gd 153				
Be 10					Ho 163				
C 14			= 1.47E-09	C C 2	Ho 166m				
Na 22			= 7.14E-15	C C 2	Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Ti 204				
Mn 54			= 2.36E-09	C C 2	Pb 205				
Fe 55			= 7.10E-16	C C 2	Pb 210			= 1.08E-15	C C 2
Co 60			= 1.68E-06	C C 2	Bi 208				
Ni 59					Bi 210m				
Ni 63			= 9.86E-09	C C 2	Po 210			= 8.31E-16	C C 2
Zn 65					Ra 223			= 7.52E-14	C C 2
Se 79					Ra 225			= 6.21E-20	C C 2
Kr 81					Ra 226			= 1.83E-14	C C 2
Kr 85					Ra 228			= 3.20E-16	C C 2
Rb 87					Ac 227			= 7.82E-14	C C 2
Sr 90			= 3.74E-05	C C 2	Th 227			= 7.53E-14	C C 2
Zr 93					Th 228			= 5.87E-09	C C 2
Nb 91					Th 229			= 6.40E-20	C C 2
Nb 92					Th 230			= 1.41E-11	C C 2
Nb 93m			= 9.66E-14	C C 2	Th 232			= 6.22E-16	C C 2
Nb 94			= 5.61E-11	C C 2	Th 234			= 7.73E-09	C C 2
Mo 93			= 9.92E-14	C C 2	Pa 231			= 8.72E-13	C C 2
Tc 97					Pa 233			= 2.75E-11	C C 2
Tc 99					U 232			= 6.49E-09	C C 2
Ru 106			= 1.05E-08	C C 2	U 233			= 3.48E-16	C C 2
Pd 107					U 234			= 2.55E-07	C C 2
Ag 108m					U 235			= 6.87E-09	C C 2
Ag 110m					U 236			= 9.10E-09	C C 2
Cd 109					U 238			= 7.73E-09	C C 2
Cd 113m					Np 237			= 2.81E-11	C C 2
Sn 119m					Pu 236				
Sn 121m					Pu 238			= 5.58E-06	C C 2
Sn 123					Pu 239			= 9.65E-06	C C 2
Sn 126					Pu 240			= 6.92E-06	C C 2
Sb 125			= 2.77E-07	C C 2	Pu 241			= 1.41E-04	C C 2
Sb 126					Pu 242			= 5.00E-11	C C 2
Te 125m			= 6.54E-08	C C 2	Am 241			= 1.51E-05	C C 2
Te 127m					Am 242m			= 2.92E-07	C C 2
I 129					Am 243			= 9.48E-14	C C 2
Cs 134			= 3.69E-07	C C 2	Cm 242			= 2.44E-07	C C 2
Cs 135					Cm 243			= 6.55E-08	C C 2
Cs 137			= 9.01E-05	C C 2	Cm 244			= 6.87E-07	C C 2
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147			= 3.12E-06	C C 2	Cf 251				
Sm 147			= 3.00E-16	C C 2	Cf 252				
Sm 151			= 4.11E-06	C C 2	Unsp a				
Eu 152			= 1.98E-13	C C 2	Unsp b/g				
Eu 154			= 8.51E-07	C C 2	Total a	0	*	3.86E-05	*
Eu 155			= 1.19E-06	C C 2	Total b/g	0	*	2.80E-04	*

Bands (Upper and Lower)

A a factor of 1.5
B a factor of 3
C a factor of 10
D a factor of 100
E a factor of 1000

Note: Bands quantify uncertainty in the mean radioactivity.

Code

1 Measured activity
2 Derived activity (best estimate)
3 Derived activity (upper limit)
4 Not present
5 Present but not significant
6 Likely to be present but not assessed
7 Present in significant quantities but not determined
8 Not expected to be present in significant quantity
* Total calculated from the 114 declared radionuclides