

WASTE STREAM	5B359	Contaminated Soil ILW
--------------	-------	-----------------------

SITE Dounreay

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 0		
Future arisings:	1.4.2053 - 31.3.2054	= 3.3		
	1.4.2054 - 31.3.2055	= 6.7		
	1.4.2055 - 31.3.2056	= 6.7		
	1.4.2056 - 31.3.2057	= 0.2		
	1.4.2057 - 31.3.2058	= 6.0		
	1.4.2058 - 31.3.2059	= 3.0		
	1.4.2065 - 31.3.2066	= 44.0		
	1.4.2077 - 31.3.2078	= 32.0		
Total future arisings:		102.0		
Total waste volume:		102.0		

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

Comment on arising rates: Arisings dates are based upon NRS Dounreay's Lifetime Plan 2024 as generated at December 2023

Additional information on quantities: The site strategy for removal of soils is under review and forecasts may need to be re-assessed. Volumes are based on limited sampling data.

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

WASTE SOURCE Concrete foundation slabs and sub-slab soils for active buildings. Also contaminated soil which has arisen from accidental releases of activity from historical operations. The soil will be excavated during new build or site remediation operations.

PHYSICAL CHARACTERISTICS

General description: Mainly soil with smaller amounts of rubble (broken up sub-slab pieces). There are no large items to influence package choice.

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): Cementitious material (e.g. concrete) (35.82%), Soil/Stone (64.18%),

Chemical state: Neutral

Sheet metal proportion / thickness: Likely to be present as small pieces in soil.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0	-	
Other ferrous metals.....	= 0	-	
Iron.....	= 0	-	
Aluminium.....	= 0	-	
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	Traces of other metals may be present.	

Organics (%wt):

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

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	= 64.2	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 35.8	-	
Sand.....	= 0	-	
Glass/Ceramics.....	= 0	-	
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	-	

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.....	NE	-
Low flash point liquids.....	NE	-
Explosive materials.....	NE	-
Phosphorus.....	NE	-
Hydrides.....	NE	-
Biological etc. materials.....	NE	-
Biodegradable materials.....	= 0	-
Putrescible wastes.....	NE	-
Non-putrescible wastes.....	NE	-
Corrosive materials.....	NE	-
Pyrophoric materials.....	NE	-
Generating toxic gases.....	NE	-
Reacting with water.....	= 0	-
Higher activity particles.....	NE	-
Soluble solids as bulk chemical compounds.....	NE	-

Hazardous substances / non hazardous pollutants:

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

Complexing agents (%wt):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	There may be natural complexing agents in the organic matter, concentrations unknown.
Total complexing agents.....	NE	-

Physical components:

	Number	Type(s) and comment
Sources.....	= 0	-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....	= 0	-
EEE Type 2.....	= 0	-
EEE Type 3.....	= 0	-
EEE Type 4.....	= 0	-
EEE Type 5.....	= 0	-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction	On-site	= 100.0
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment		
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments:

Encapsulation within 6m3 boxes

Conditioning method:

Contaminated soils and concrete will most likely be encapsulated in 6m3 boxes for long term storage. However the strategy for this waste route is not finalised.

Conditioning plants:

Plant Name	Location
Mobile Conditioning plant	Dounreay

Likely conditioning matrix:

Non-standard

Further information on the conditioning matrix:

Dounreay will use OPC1:3 PFA

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	6 m³ concrete box (HD)	100.0	3.8	5.7	27	-

Range in container waste loading: Not yet estimated

Other information on packaging and conditioning: -

Conditioned density (t/m³): ~ 2.5

Conditioned density comment: The density is likely to be around 2 to 3 t/m³

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	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
Near-site NSDF	Dounreay LLWDF	100.0	RED	it is possible that further characterisation will show that this waste can be consigned at a lower waste category and will be suitable for disposal at the DLLWDF
In-situ / on-site disposal	In-situ / on-site disposal	100.0	RED	It is possible that further characterisation will show that this waste can be consigned at a lower waste category and will be suitable for In-situ disposal

RADIOACTIVITY

Source: The source of the activity is accidental releases of a historic nature.

Uncertainty: -

Measurement of radioactivities: Specific Activity determined from UKRWI decayed down to 2025

Chemical form of radionuclides:

- H-3: -
- C-14: -
- Cl-36: Possibly present as general contamination.
- Se-79: -
- Tc-99: -
- I-129: Possibly present as general contamination.
- Ra: -
- Th: Possibly present as general contamination.
- U: Possibly present as discrete particles or general contamination.
- Np: -
- Pu: Possibly present as general contamination.

WASTE STREAM 5B359 Contaminated Soil ILW									
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					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					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					Pb 205				
Fe 55					Pb 210			= 5.32E-15	C C 2
Co 60			= 2.19E-04	C C 2	Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210			= 3.21E-15	C C 2
Zn 65					Ra 223			= 4.85E-13	C C 2
Se 79					Ra 225			= 2.06E-19	C C 2
Kr 81					Ra 226			= 1.77E-13	C C 2
Kr 85					Ra 228			= 1.71E-17	C C 2
Rb 87					Ac 227			= 5.24E-13	C C 2
Sr 90			= 7.29E-02	C C 2	Th 227			= 4.93E-13	C C 2
Zr 93					Th 228			= 4.92E-18	C C 2
Nb 91					Th 229			= 2.19E-19	C C 2
Nb 92					Th 230			= 2.72E-10	C C 2
Nb 93m					Th 232			= 1.06E-16	C C 2
Nb 94					Th 234				
Mo 93					Pa 231			= 1.13E-11	C C 2
Tc 97					Pa 233			= 3.79E-10	C C 2
Tc 99					U 232				
Ru 106					U 233			= 2.39E-15	C C 2
Pd 107					U 234			= 9.86E-06	C C 2
Ag 108m					U 235			= 1.79E-07	C C 2
Ag 110m					U 236			= 7.16E-07	C C 2
Cd 109					U 238				
Cd 113m					Np 237			= 3.93E-10	C C 2
Sn 119m					Pu 236				
Sn 121m					Pu 238			= 3.50E-04	C C 2
Sn 123					Pu 239			= 6.83E-04	C C 2
Sn 126					Pu 240			= 1.43E-07	C C 2
Sb 125					Pu 241			= 1.44E-04	C C 2
Sb 126					Pu 242				
Te 125m					Am 241			= 4.04E-04	C C 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137			= 8.78E-02	C C 2	Cm 244			= 2.77E-04	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					Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152					Unsp b/g				
Eu 154					Total a	0	*	1.72E-03	*
Eu 155					Total b/g	0	*	1.61E-01	*

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