

<b>WASTE STREAM</b>	<b>5B351</b>	<b>Changerooms LLW</b>
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**SITE** Dounreay  
**SITE OWNER** Nuclear Decommissioning Authority  
**WASTE CUSTODIAN** Dounreay Site Restoration Limited  
**WASTE TYPE** LLW

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	0 m <sup>3</sup>
Future arisings -	1.4.2019 - 31.3.2025.....	38.0 m <sup>3</sup>
Total future arisings:		38.0 m <sup>3</sup>
Total waste volume:		38.0 m <sup>3</sup>

Comment on volumes: Arisings have been revised in line with the Predictive Waste Inventory walk round exercise. Stocks will be captured in Waste Streams 5B15 and 5B16.

Uncertainty factors on volumes:  
 Stock (upper): x Arisings (upper) x 1.2  
 Stock (lower): x Arisings (lower) x 0.8

**WASTE SOURCE** Waste from the building decommissioning of the changerooms.

**PHYSICAL CHARACTERISTICS**

General description: Mixture of building structure materials.  
 Physical components (%wt): Concrete (69.003%), rubber (26%), steel (4.95%), plasterboard (0.02%), plastic(0.003%) asphalt (0.02%), asbestos (0.004%)  
 Sealed sources: Not yet determined.  
 Bulk density (t/m<sup>3</sup>): 0.26  
 Comment on density: The Bulk Density is based on consignor's records

**CHEMICAL COMPOSITION**

General description and components (%wt): Concrete (69.003%), rubber (26%), steel (4.95%), plasterboard (0.02%), plastic(0.003%) asphalt (0.02%), asbestos (0.004%)  
 Chemical state: Neutral  
 Chemical form of radionuclides: Cl-36: Not likely to be present.  
 I-129: Not likely to be present.  
 U: Uranium contamination is likely.

Metals and alloys (%wt): -

Stainless steel.....	NE
Other ferrous metals.....	5.0
Iron.....	
Aluminium.....	
Beryllium.....	NE
Cobalt.....	0
Copper.....	
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	
Titanium.....	
Uranium.....	P
Zinc.....	0
Zircaloy/Zirconium.....	0
Other metals.....	0

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## Organics (%wt):

	-	
Total celluloseics.....	0	
Paper, cotton.....	0	
Wood.....	0	
Halogenated plastics .....	<0.01	No further information available at this time
Total non-halogenated plastics.....	<0.01	No further information available at this time
Condensation polymers.....	0	
Others.....	0	
Organic ion exchange materials....	0	
Total rubber.....	26.0	
Halogenated rubber .....	0	
Non-halogenated rubber.....	26.0	
Hydrocarbons.....	0.02	
Oil or grease .....		
Fuel.....		
Asphalt/Tarmac (cont.coal tar)...	0.02	
Asphalt/Tarmac (no coal tar).....		
Bitumen.....		
Others.....		
Other organics.....	0	

## Other materials (%wt):

Asbestos is low to medium risk on site asbestos register	
Inorganic ion exchange materials.	0
Inorganic sludges and flocs.....	0
Soil.....	0
Brick/Stone/Rubble.....	0.02
Cementitious material.....	69.0
Sand.....	
Glass/Ceramics.....	
Graphite.....	0
Desiccants/Catalysts.....	0
Asbestos.....	<0.01
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	0
Free non-aqueous liquids.....	0
Powder/Ash.....	0

## Inorganic anions (%wt):

-

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Fluoride.....	0
Chloride.....	0
Iodide.....	0
Cyanide.....	0
Carbonate.....	0
Nitrate.....	0
Nitrite.....	0
Phosphate.....	0
Sulphate.....	0
Sulphide.....	0

Materials of interest for  
waste acceptance criteria:

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

Hazardous substances /  
non hazardous pollutants:

-	
Acrylamide.....	
Benzene.....	NE
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	NE
Styrene.....	
Tri-butyl phosphate.....	NE
Other organophosphates.....	
Vinyl chloride.....	NE
Arsenic.....	NE
Barium.....	
Boron.....	NE

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Cadmium..... NE  
 Caesium.....  
 Selenium..... NE  
 Chromium..... NE  
 Molybdenum..... NE  
 Thallium.....  
 Tin..... NE  
 Vanadium..... NE  
 Mercury compounds.....  
 Others..... NE  
 Electronic Electrical Equipment (EEE)  
     EEE Type 1.....  
     EEE Type 2.....  
     EEE Type 3.....  
     EEE Type 4.....  
     EEE Type 5.....

Complexing agents (%wt):

No  
 EDTA.....  
 DPTA.....  
 NTA.....  
 Polycarboxylic acids.....  
 Other organic complexants.....  
 Total complexing agents..... 0

**TREATMENT, PACKAGING AND DISPOSAL**

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

Treatment	On-site / Off site	Stream volume %
Low force compaction	On-site	27.0
Supercompaction (HFC)		
Incineration	On-site	100.0
Solidification		
Decontamination		
Metal treatment		
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		

Comment on planned treatments:

Uncompacted drums will be supercompacted before being placed in HHISOs. No further treatment will be carried out while the waste remains in long term storage. The waste will be encapsulated before final disposal. DSRL is investigating the feasibility of alternative waste treatment routes but no decision has been made on their use yet.

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Disposal Routes:	Disposal Route	Stream volume %
		Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known

**Upcoming (2019/20-2021/22) Waste Routing (if expected to change from above):**

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known			

**Waste Packaging for Disposal:**

Container	Stream volume %	Waste loading m <sup>3</sup>	Number of packages
1/3 Height IP-1 ISO 2/3 Height IP-2 ISO 1/2 Height WAMAC IP-2 ISO 1/2 Height IP-2 Disposal/Re-usable ISO 2m box (no shielding) 4m box (no shielding) Other	100.0	10	4

Other information:                      The waste will consist of large uncompactable items and 200 litre drums that have already been compacted. DSRL is investigating the feasibility of alternative LLW Disposal Container.

**Waste Planned for Disposal at the LLW Repository:** (Not applicable to this waste stream)

- Container voidage: -
- Waste Characterisation Form (WCH): -
- Waste consigned for disposal to LLWR in year of generation: -
- Potential for the waste to contain discrete items: -

**Non-Containerised Waste for In-Vault Grouting:** (Not applicable to this waste stream)

- Stream volume (%): -
- Waste stream variation: -
- Bounding cuboidal volume: -
- Inaccessible voidage: -
- Other information: -

**WASTE STREAM****5B351****Changerooms LLW****RADIOACTIVITY**

Source: -

Uncertainty: -

Definition of total alpha and total beta/gamma: Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.

Measurement of radioactivities: Specific Activities were derived from consignor's records for operational LLW consigned from the facility.

Other information: Specific Activities have been re-evaluated since 2016

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3					Gd 153				
Be 10					Ho 163				
C 14			9.51E-08	CC 2	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					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60			4.89E-09	CC	Bi 208				
Ni 59					Bi 210m				
Ni 63			1.97E-08	CC 2	Po 210		4.93E-14	CC	
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226		1.97E-13	CC	
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90			1.86E-07	CC	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m			8.46E-10	CC	Th 232				
Nb 94					Th 234				
Mo 93			8.46E-10	CC	Pa 231				
Tc 97					Pa 233				
Tc 99			6.85E-12	CC	U 232				
Ru 106					U 233				
Pd 107					U 234		3.65E-10	CC	
Ag 108m					U 235		6.35E-12	CC	
Ag 110m					U 236		5.02E-11	CC	
Cd 109					U 238		7.88E-13	CC	
Cd 113m					Np 237		4.93E-14	CC	
Sn 119m					Pu 236				
Sn 121m			6.85E-12	CC	Pu 238		2.95E-09	CC	
Sn 123					Pu 239		2.94E-09	CC	
Sn 126					Pu 240		3.00E-09	CC	
Sb 125			3.36E-10	CC	Pu 241		1.13E-07	CC	
Sb 126					Pu 242				
Te 125m					Am 241		4.95E-09	CC	
Te 127m					Am 242m		1.30E-10	CC	
I 129					Am 243		8.37E-13	CC	
Cs 134			1.80E-09	CC	Cm 242		1.14E-10	CC	
Cs 135					Cm 243		5.81E-12	CC	
Cs 137			2.53E-07	CC	Cm 244		7.07E-10	CC	
Ba 133			4.08E-09	CC	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147			1.25E-08	CC	Cf 251				
Sm 147					Cf 252				
Sm 151			7.17E-09	CC	Other a				
Eu 152			1.75E-09	CC	Other b/g				
Eu 154			2.77E-09	CC	<b>Total a</b>	<b>0</b>	<b>1.51E-08</b>	<b>CC 2</b>	
Eu 155			2.88E-09	CC	<b>Total b/g</b>	<b>0</b>	<b>7.07E-07</b>	<b>CC 2</b>	

**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 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