

<b>WASTE STREAM</b>	<b>5B334</b>	<b>DCP, Vault Store and Extension ILW</b>
---------------------	--------------	---

**SITE** Dounreay  
**SITE OWNER** Nuclear Decommissioning Authority  
**WASTE CUSTODIAN** Dounreay Site Restoration Limited  
**WASTE TYPE** ILW

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	8.8 m <sup>3</sup>
Future arisings -	1.4.2019 - 31.3.2022.....	45.0 m <sup>3</sup>
Total future arisings:		45.0 m <sup>3</sup>
Total waste volume:		53.8 m <sup>3</sup>

Comment on volumes: It should be noted that the DSRL site programme is currently under review and that arisings dates are subject to change. Arisings have been revised in line with the Predictive Waste Inventory walk round exercise.

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

**WASTE SOURCE** Waste arisings will be from the decommissioning of the DCP itself only (short term) with the Stores being decommissioned in around 80 years time.

**PHYSICAL CHARACTERISTICS**

General description: Drum conveying and manipulation equipment, pressure vessels and pipework. There are no large items that will influence packaging selection.  
 Physical components (%vol): Stainless steel (100%)  
 Sealed sources: Not yet determined.  
 Bulk density (t/m<sup>3</sup>): 0.27  
 Comment on density: The bulk density is approximately based on consignor's records.

**CHEMICAL COMPOSITION**

General description and components (%wt): Stainless steel pipework and vessels (100%)

Chemical state: Neutral

Chemical form of radionuclides:  
 H-3: May be present at very low concentrations.  
 C-14: May be present at very low concentrations.  
 Cl-36: May be present at very low concentrations.  
 Se-79: May be present at very low concentrations.  
 Tc-99: May be present at very low concentrations.  
 I-129: May be present at very low concentrations.  
 Ra: May be present at very low concentrations.  
 Th: May be present at very low concentrations.  
 U: May be present as nitrate at low concentrations.  
 Np: May be present at very low concentrations.  
 Pu: May be present as nitrate at low concentrations.

Metals and alloys (%wt): Both sheet and bulk metals likely to be present, proportions not specified.

Stainless steel.....	100.0	Stainless steel assumed to be M316.
Other ferrous metals.....		
Iron.....		
Aluminium.....		
Beryllium.....	P	
Cobalt.....	0	
Copper.....	NE	
Lead.....	NE	
Magnox/Magnesium.....	NE	

<b>WASTE STREAM</b>	<b>5B334</b>	<b>DCP, Vault Store and Extension ILW</b>
---------------------	--------------	---

	Nickel.....		
	Titanium.....		
	Uranium.....	P	
	Zinc.....	NE	
	Zircaloy/Zirconium.....	NE	
	Other metals.....	NE	Other metals not specified.
Organics (%wt):	-		
	Total cellulose.....	0	
	Paper, cotton.....	0	
	Wood.....		
	Halogenated plastics .....	0	
	Total non-halogenated plastics.....		
	Condensation polymers.....	NE	
	Others.....	NE	
	Organic ion exchange materials....		
	Total rubber.....	0	
	Halogenated rubber .....	0	
	Non-halogenated rubber.....		
	Hydrocarbons.....		
	Oil or grease .....		
	Fuel.....		
	Asphalt/Tarmac (cont.coal tar)...		
	Asphalt/Tarmac (no coal tar)....		
	Bitumen.....		
	Others.....		
	Other organics.....	NE	
Other materials (%wt):	-		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs.....	0	
	Soil.....	0	
	Brick/Stone/Rubble.....	NE	
	Cementitious material.....		
	Sand.....	0	
	Glass/Ceramics.....	0	
	Graphite.....	0	
	Desiccants/Catalysts.....	0	
	Asbestos.....	0	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	

<b>WASTE STREAM</b>	<b>5B334</b>	<b>DCP, Vault Store and Extension ILW</b>
---------------------	--------------	---

	Powder/Ash.....	0
Inorganic anions (%wt):	Inorganic anions are present at approximately 3%.	
	Fluoride.....	NE
	Chloride.....	NE
	Iodide.....	NE
	Cyanide.....	0
	Carbonate.....	NE
	Nitrate.....	TR
	Nitrite.....	NE
	Phosphate.....	NE
	Sulphate.....	NE
	Sulphide.....	NE

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

**WASTE STREAM      5B334      DCP, Vault Store and Extension ILW**

Barium.....  
 Boron..... NE  
 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

**PACKAGING AND CONDITIONING**

Conditioning method:        The waste is likely to be grouted into 500 litre drums.  
 Plant Name:                 DCP  
 Location:                    Dounreay  
 Plant startup date:         -  
 Total capacity                NE  
 (m<sup>3</sup>/y incoming waste):  
 Target start date for  
 packaging this stream:     -  
 Throughput for this stream    NE  
 (m<sup>3</sup>/y incoming waste):  
 Other information:         -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	500 l drum	100.0	0.3	0.5	180

<b>WASTE STREAM</b>	<b>5B334</b>	<b>DCP, Vault Store and Extension ILW</b>
---------------------	--------------	---

Likely container type comment: The conditioning factor will be about 1.7.

Range in container waste volume: -

Other information on containers: Stainless Steel

Likely conditioning matrix: Cement

Other information: -

Conditioned density (t/m<sup>3</sup>): ~2.5

Conditioned density comment: The density is likely to be around 2 - 3 t/m<sup>3</sup>.

Other information on conditioning: -

Opportunities for alternative disposal routing: No

Treatment	Stream volume (%)	Comment
-	-	-

**RADIOACTIVITY**

Source: The main sources of activity are contaminated equipment/structures.

Uncertainty: The activities given are best estimates.

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: Stocks data has been calculated from combined ILW LoC radionuclide information. Arisings specific activity has been calculated using consignors records.

Other information: Specific activities have been re-evaluated since the 2016 UK Inventory.

**WASTE STREAM 5B334 DCP, Vault Store and Extension ILW**

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	1.12E-01	CC 2			Gd 153				
Be 10	5.48E-07	CC 2			Ho 163				
C 14	1.03E-02	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	1.44E-05	CC 2			Pt 193				
Mn 53	8.76E-03	CC			Tl 204				
Mn 54	7.55E-08	CC 2			Pb 205				
Fe 55	1.90E-01	CC 2			Pb 210	3.73E-13	CC 2		
Co 60	1.19E+01	CC 2			Bi 208				
Ni 59	3.41E-02	CC 2			Bi 210m				
Ni 63	9.23E+00	CC 2			Po 210	2.19E-13	CC 2	8.50E-08	CC 2
Zn 65	1.47E-12	CC			Ra 223	3.37E-11	CC 2		
Se 79	1.84E-05	CC 2			Ra 225	3.09E-09	CC 2		
Kr 81					Ra 226	2.59E-12	CC 2	1.84E-07	CC 2
Kr 85					Ra 228	3.95E-17	CC 2		
Rb 87					Ac 227	3.42E-11	CC 2		
Sr 90	1.17E+00	CC 2	4.62E-02	CC 2	Th 227	3.39E-11	CC 2		
Zr 93	1.68E-04	CC 2			Th 228	3.03E-09	CC 2		
Nb 91					Th 229	3.10E-09	CC 2		
Nb 92					Th 230	8.09E-10	CC 2		
Nb 93m	4.40E-02	CC 2	8.93E-04	CC 2	Th 232	8.90E-17	CC 2		
Nb 94	3.17E-03	CC 2			Th 234	1.04E-05	CC 2		
Mo 93	1.89E-02	CC 2	8.93E-04	CC 2	Pa 231	1.63E-10	CC 2		
Tc 97					Pa 233	5.39E-06	CC 2		
Tc 99	9.09E-04	CC 2	3.79E-06	CC 2	U 232		CC		
Ru 106	8.90E-06	CC 2			U 233	1.82E-06	CC 2		
Pd 107		CC 2			U 234	7.22E-06	CC 2		
Ag 108m	1.48E-04	CC 2			U 235	4.97E-07	CC 2		
Ag 110m	5.03E-12	CC			U 236	2.06E-07	CC 2		
Cd 109			2.66E-05	CC	U 238	1.04E-05	CC 2		
Cd 113m	1.53E-03	CC 2			Np 237	5.41E-06	CC 2	4.36E-09	CC 2
Sn 119m					Pu 236		CC		
Sn 121m			3.93E-06	CC 2	Pu 238	8.96E-02	CC 2	1.05E-04	CC 2
Sn 123					Pu 239	4.19E-01	CC 2	5.32E-06	CC 2
Sn 126	3.32E-05	CC 2			Pu 240	3.89E-01	CC 2	3.39E-06	CC 2
Sb 125	1.63E-03	CC 2			Pu 241	7.13E+00	CC 2	1.14E-03	CC 2
Sb 126	4.64E-06	CC 2			Pu 242	3.38E-04	CC 2		
Te 125m	3.97E-04	CC 2			Am 241	5.98E-01	CC 2	2.96E-05	CC 2
Te 127m					Am 242m	5.92E-02	CC 2		
I 129	1.55E-06	CC 2			Am 243	5.69E-04	CC 2		
Cs 134	8.76E-04	CC 2	2.39E-04	CC 2	Cm 242	4.94E-02	CC 2		
Cs 135	2.90E-05	CC 2			Cm 243	3.09E-03	CC 2		
Cs 137	3.39E+00	CC 2	5.06E-02	CC 2	Cm 244	2.53E-01	CC 2	4.18E-09	CC 2
Ba 133					Cm 245	7.95E-06	CC 2		
La 137					Cm 246	7.94E-07	CC 2		
La 138					Cm 248				
Ce 144	5.02E-09	CC 2			Cf 249				
Pm 145					Cf 250				
Pm 147	1.26E-02	CC 2			Cf 251				
Sm 147	1.62E-11	CC 2			Cf 252				
Sm 151	1.26E-01	CC 2	1.52E-04	CC 2	Other a				
Eu 152	9.50E-02	CC 2	3.75E-05	CC 2	Other b/g				
Eu 154	4.73E-02	CC 2	8.33E-05	CC 2	<b>Total a</b>	<b>1.80E+00</b>	<b>CC 2</b>	<b>1.43E-04</b>	<b>CC 2</b>
Eu 155	2.42E-02	CC 2			<b>Total b/g</b>	<b>3.37E+01</b>	<b>CC 2</b>	<b>1.00E-01</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