

<b>WASTE STREAM</b>	<b>3L27</b>	<b>Bypass Blowdown Filters (LLW)</b>
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**SITE** Heysham 1

**SITE OWNER** EDFE NGL

**WASTE CUSTODIAN** EDFE NGL

**WASTE TYPE** LLW

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	~5.4 m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2025.....	~0.7 m <sup>3</sup>
	1.4.2025 - 31.3.2028.....	~1.2 m <sup>3</sup>
	1.4.2028 - 31.3.2034.....	~1.3 m <sup>3</sup>
	1.4.2034 - 31.3.2037.....	~0.5 m <sup>3</sup>
Total future arisings:		3.7 m <sup>3</sup>
Total waste volume:		9.1 m <sup>3</sup>

Comment on volumes: Total stocks at 1.4.2022 of 33 Bypass Blowdown Filters (BPBDFs); 23 of these are estimated to be LLW. 3 are estimated to decay to LLW levels in the period 1.4.2022-31.3.2025.5 are estimated to decay to LLW levels in the period 1.4.2025-31.3.2028.2 are estimated to decay to LLW levels in the period 1.4.2028-31.3.2031.A further 4 BPBDFs are forecast to arise in the period 1.4.2022-31.3.2025 (as 2 BPBDFs are estimated to be generated per year of operations); these are estimated to decay to LLW levels in the period 1.4.2025-31.3.2034.A further 2 BPBDFs are forecast to arise in the period 1.4.2025-31.3.2028 (as a result of de-planting); these are estimated to decay to LLW levels in the period 1.4.2034-31.3.2037.

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper) x 1.75  
 Stock (lower): x 0.75 Arisings (lower) x 0.25

**WASTE SOURCE** BPBDFs remove particulate from the primary coolant circuit and require replacement when differential pressure drops below a certain level.

**PHYSICAL CHARACTERISTICS**

General description: Each filter assembly consists of 19 stainless steel filter elements attached to a stainless steel tubesheet. The filter elements have sintered steel metal fibre filter elements. The assemblies weigh 220kg.

Physical components (%wt): Stainless steel (~98%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~0.6

Comment on density: Based on filter volume and mass.

**CHEMICAL COMPOSITION**

General description and components (%wt): Filter assemblies are made entirely of stainless steel, however, small quantities of debris (spalled oxides, carbonaceous debris) will be present in the waste.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Diffused into materials  
 C-14: Graphite  
 Cl-36: Incorporated into steels  
 Se-79: Not expected to be significant  
 Tc-99: Not expected to be significant  
 I-129: Not expected to be significant  
 Ra: Not expected to be significant  
 Th: Not expected to be significant  
 U: Not assessed  
 Np: Not expected to be significant  
 Pu: Not assessed

Metals and alloys (%wt): 100% bulk items.

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~98.0		
Other ferrous metals.....	TR		
Iron.....	TR		
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		

Organics (%wt): Plastic bagging used to wrap filter.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....			
Paper, cotton.....			
Wood.....			
Halogenated plastics .....			
Total non-halogenated plastics.....	~1.0		
Condensation polymers.....			
Others.....			
Organic ion exchange materials....			
Total rubber.....			
Halogenated rubber .....			
Non-halogenated rubber.....			
Hydrocarbons.....			
Oil or grease .....			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....			

Other materials (%wt): Powder/ash here represents the carbon deposits entrained on the filter.

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	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..			
Inorganic sludges and flocs.....			
Soil.....			
Brick/Stone/Rubble.....			
Cementitious material.....			
Sand.....			
Glass/Ceramics.....			
Graphite.....			
Desiccants/Catalysts.....			
Asbestos.....			
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....			
Free non-aqueous liquids.....			
Powder/Ash.....	~1.0		

Inorganic anions (%wt): -

	(%wt)	Type(s) and comment
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: -

	(%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.....	0	
Non-putrescible wastes.....	0	

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Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....	P	May be present
Soluble solids as bulk chemical compounds.....	0	

Hazardous substances /  
non hazardous pollutants: -

	(%wt)	Type(s) and comment
Acrylamide.....	NE	
Benzene.....	NE	
Chlorinated solvents.....	NE	
Formaldehyde.....	NE	
Organometallics.....	NE	
Phenol.....	NE	
Styrene.....	NE	
Tri-butyl phosphate.....	NE	
Other organophosphates.....	NE	
Vinyl chloride.....	NE	
Arsenic.....	NE	
Barium.....	NE	
Boron.....	NE	
Boron (in Boral).....	NE	
Boron (non-Boral).....	NE	
Cadmium.....	NE	
Caesium.....	NE	
Selenium.....	NE	
Chromium.....	NE	
Molybdenum.....	NE	
Thallium.....	NE	
Tin.....	NE	
Vanadium.....	NE	
Mercury compounds.....	NE	
Others.....	NE	
Electronic Electrical Equipment (EEE)		
EEE Type 1.....	NE	
EEE Type 2.....	NE	
EEE Type 3.....	NE	
EEE Type 4.....	NE	
EEE Type 5.....	NE	

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Complexing agents (%wt): Not yet determined

	(%wt)	Type(s) and comment
EDTA.....	P	Category 2
DPTA.....	P	Category 2
NTA.....	P	Category 2
Polycarboxylic acids.....		
Other organic complexants.....		
Total complexing agents.....		

Potential for the waste to contain discrete items: Yes.

**TREATMENT, PACKAGING AND DISPOSAL**

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

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

Comment on planned treatments:

-

**Disposal Routes:**

Disposal Route	Stream volume %	Disposal density t/m3
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	100.0	

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

-

**Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):**

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
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			

**Opportunities for alternative disposal routing:** No

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Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

**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	~1.4	7

Other information: Waste is transported to an off-site treatment facility (Inutec) for treatment and disposal as LLW.

**Waste Planned for Disposal at the LLW Repository:**

Container voidage: -

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC). The waste has a current WCH. Inventory information is consistent with the current WCH.

Waste consigned for disposal to LLWR in year of generation: No. 10 years

**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: -

**RADIOACTIVITY**

Source: Contamination by activation products will be the main source of activity.

Uncertainty: Specific activity is a function of station operating history. The values quoted are indicative of the activities that might be expected.

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: A combination of sample analysis and theoretical assessments. The specific activities stated for future arisings are typical values for a filter at the time of arising.

Other information: -

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	3.95E-03	AA 2	3.95E-03	AA 2	Gd 153				
Be 10					Ho 163				
C 14	4.27E-04	AA 2	4.27E-04	AA 2	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	1.12E-05	AA 2	1.12E-05	AA 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	3.18E-06	AA 2	3.18E-06	AA 2	Pb 205				
Fe 55	4.20E-03	AA 2	4.20E-03	AA 2	Pb 210				
Co 60	4.58E-04	AA 2	4.58E-04	AA 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	1.97E-03	AA 2	1.97E-03	AA 2	Po 210				
Zn 65	2.38E-08	AA 2	2.38E-08	AA 2	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	7.15E-06	AA 2	7.15E-06	AA 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	1.85E-06	AA 2	1.85E-06	AA 2	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106	5E-08	AA 2	5E-08	AA 2	U 233				
Pd 107					U 234				
Ag 108m	2.39E-06	AA 2	2.39E-06	AA 2	U 235				
Ag 110m	1.10E-09	AA 2	1.10E-09	AA 2	U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	3.03E-05	AA 2	3.03E-05	AA 2
Sn 123					Pu 239	1.07E-05	AA 2	1.07E-05	AA 2
Sn 126					Pu 240	1.07E-05	AA 2	1.07E-05	AA 2
Sb 125	1.25E-06	AA 2	1.25E-06	AA 2	Pu 241	8.88E-06	AA 2	8.88E-06	AA 2
Sb 126					Pu 242				
Te 125m					Am 241	2.78E-06	AA 2	2.78E-06	AA 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	1.18E-06	AA 2	1.18E-06	AA 2	Cm 242	8.40E-14	AA 2	8.40E-14	AA 2
Cs 135					Cm 243	3.64E-07	AA 2	3.64E-07	AA 2
Cs 137	2.37E-05	AA 2	2.37E-05	AA 2	Cm 244	2.95E-07	AA 2	2.95E-07	AA 2
Ba 133	1.44E-06	AA 2	1.44E-06	AA 2	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	5.71E-10	AA 2	5.71E-10	AA 2	Cf 249				
Pm 145					Cf 250				
Pm 147	8.48E-06	AA 2	8.48E-06	AA 2	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a		4		4
Eu 152	2.80E-06	AA 2	2.80E-06	AA 2	Other b/g		5		5
Eu 154	1.37E-06	AA 2	1.37E-06	AA 2	<b>Total a</b>	<b>5.51E-05</b>	<b>AA 2</b>	<b>5.51E-05</b>	<b>AA 2</b>
Eu 155	1.22E-06	AA 2	1.22E-06	AA 2	<b>Total b/g</b>	<b>1.11E-02</b>	<b>AA 2</b>	<b>1.11E-02</b>	<b>AA 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