

WASTE STREAM	3L24	Bypass Blowdown Filters
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SITE Heysham 1

SITE OWNER EDFE NGL

WASTE CUSTODIAN EDFE NGL

WASTE TYPE ILW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	~2.3 m ³
Future arisings -	1.4.2022 - 31.3.2025.....	~0.2 m ³
Total future arisings:		0.2 m ³
Total waste volume:		2.5 m ³

Comment on volumes: Total stocks at 1.4.2022 of 33 Bypass Blowdown Filters (BPBDFs); 10 of these are estimated to be ILW.

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 Filters 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/m³): ~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.

	(%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		

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Copper.....	0
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	0
Titanium.....	0
Uranium.....	0
Zinc.....	0
Zircaloy/Zirconium.....	0
Other metals.....	0

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....			
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): -

	(%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.....			

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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	
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	

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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

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.....	0	

Potential for the waste to contain discrete items: Yes.

PACKAGING AND CONDITIONING

Conditioning method: The waste is expected to be encapsulated without being supercompacted.

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Plant Name: None.

Location: Heysham 1 Power Station.

Plant startup date: Not yet determined.

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m³/y incoming waste): -

Other information: All waste will be retrieved when a conditioning campaign is undertaken. There will probably be more than one campaign.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	500 l drum	100.0	~0.23	0.47	11

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: Blast furnace slag/Ordinary Portland cement mixture

Other information: -

Conditioned density (t/m³): ~3.0

Conditioned density comment: Expected to be between 2 and 4 t/m³. The maximum density of the conditioned waste will be less than 7.5 t/m³.

Other information on conditioning: -

Opportunities for alternative disposal routing: Yes

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
Disposal at a Geological Disposal Facility	Disposal at LLWR	100.0	2024 to 2034	High	A number of filters are LLW and recorded under 3L27, however this waste stream provisions for any that remain as ILW.

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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Bypass Blowdown Filters

Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	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	5.11E-03	CC 2	6.76E-03	CC 2	Gd 153				
Be 10					Ho 163				
C 14	4.32E-04	CC 2	4.32E-04	CC 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	2.64E-03	CC 2	2.64E-03	CC 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	5.49E-05	CC 2	3.15E-03	CC 2	Pb 205				
Fe 55	1.51E-02	CC 2	5.44E-02	CC 2	Pb 210				
Co 60	2.22E-03	CC 2	4.28E-03	CC 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	1.74E-03	CC 2	1.80E-03	CC 2	Po 210				
Zn 65	2.55E-06	CC 2	4.54E-04	CC 2	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	7.21E-05	CC 2	8.12E-05	CC 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	8.99E-06	CC 2	8.99E-06	CC 2	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106	1.92E-06	CC 2	5.93E-05	CC 2	U 233				
Pd 107					U 234	2.78E-09	CC 2	2.78E-09	CC 2
Ag 108m	8.07E-06	CC 2	8.13E-06	CC 2	U 235	4.42E-11	CC 2	4.42E-11	CC 2
Ag 110m	1.03E-07	CC 2	1.63E-05	CC 2	U 236	7.11E-10	CC 2	7.11E-10	CC 2
Cd 109					U 238	8.26E-10	CC 2	8.26E-10	CC 2
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	1.63E-07	CC 2	1.70E-07	CC 2
Sn 123					Pu 239		6		6
Sn 126					Pu 240	<2.87E-07	C 3	<2.87E-07	C 3
Sb 125	4.45E-06	CC 2	1.58E-05	CC 2	Pu 241	1.26E-05	CC 2	1.61E-05	CC 2
Sb 126					Pu 242				
Te 125m					Am 241	4.41E-07	CC 2	4.44E-07	CC 2
Te 127m					Am 242m				
I 129	3.30E-11	CC 2	3.30E-11	CC 2	Am 243				
Cs 134	2.5E-05	CC 2	1.34E-04	CC 2	Cm 242	5.39E-11	CC 2	1.28E-07	CC 2
Cs 135					Cm 243		6		6
Cs 137	1.17E-04	CC 2	1.32E-04	CC 2	Cm 244	<2.35E-08	C 3	<2.64E-08	C 3
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	3.39E-07	CC 2	2.89E-05	CC 2	Cf 249				
Pm 145					Cf 250				
Pm 147	3.86E-06	CC 2	1.45E-05	CC 2	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a		8		8
Eu 152	1.12E-05	CC 2	1.46E-05	CC 2	Other b/g	5.00E-06	CC 2	4.65E-02	CC 2
Eu 154	7.44E-06	CC 2	1.11E-05	CC 2	Total a	9.19E-07	CC 2	1.06E-06	CC 2
Eu 155	4.68E-06	CC 2	9.42E-06	CC 2	Total b/g	2.75E-02	CC 2	1.21E-01	CC 2

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