

WASTE STREAM	3M09	Active Effluent Filters Sludge
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SITE Heysham 2

SITE OWNER EDFE NGL

WASTE CUSTODIAN EDFE NGL

WASTE TYPE LLW; SPD1

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	2.8 m ³
Future arisings -	1.4.2022 - 31.3.2028.....	2.4 m ³
	1.4.2028 - 31.3.2030.....	1.6 m ³
	1.4.2030 - 31.3.2031.....	3.2 m ³
Total future arisings:		7.2 m ³
Total waste volume:		10.0 m ³

Comment on volumes: Rates of arisings are dependent upon station operations. Station operation is assumed to end in 2030 and defuelling to last 2 years.

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper) x 1.5
 Stock (lower): x 0.75 Arisings (lower) x 0.5

WASTE SOURCE Sludge arising from filtration and other operations within the Active Effluent Treatment Plant.

PHYSICAL CHARACTERISTICS

General description: Sludge, sand and anthracite. There are no large items that require special handling.

Physical components (%vol): Sludge, Sand and Anthracite (vol% not assessed). No other constituents identified.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): A wide variety of materials including sand and anthracite.

Chemical state: Neutral

Chemical form of radionuclides: H-3: As tritiated water
 C-14: As graphite
 Cl-36: To be determined
 Se-79: Not Significant
 Tc-99: Not Significant
 I-129: Not Significant
 Ra: To be determined
 Th: To be determined
 U: To be determined
 Np: To be determined
 Pu: To be determined

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	NE		
Iron.....	NE		
Aluminium.....	NE		
Beryllium.....	NE		
Cobalt.....	NE		

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

Organics (%wt): To be further assessed following operational experience. Quantities of cellulose would be small.

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

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	~100.0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....	NE		
Glass/Ceramics.....	0		
Graphite.....	0		
Desiccants/Catalysts.....	0		

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Asbestos.....	NE
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	NE
Free non-aqueous liquids.....	NE
Powder/Ash.....	NE

Inorganic anions (%wt): -

	(%wt)	Type(s) and comment
Fluoride.....	TR	
Chloride.....	TR	
Iodide.....	TR	
Cyanide.....	0	
Carbonate.....	~1.4	
Nitrate.....	TR	
Nitrite.....	NE	
Phosphate.....	TR	
Sulphate.....	~0.30	
Sulphide.....	TR	

Materials of interest for waste acceptance criteria: The possible presence of any materials likely to represent a fire or other non-radiological hazard has not been assessed. Anthracite is combustible if dry.

	(%wt)	Type(s) and comment
Combustible metals.....	NE	
Low flash point liquids.....	NE	
Explosive materials.....	0	
Phosphorus.....	NE	
Hydrides.....	NE	
Biological etc. materials.....	NE	
Biodegradable materials.....	NE	
Putrescible wastes.....		
Non-putrescible wastes.....	0	
Corrosive materials.....	NE	
Pyrophoric materials.....	NE	
Generating toxic gases.....	NE	
Reacting with water.....	NE	
Higher activity particles.....	0	Not expected
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).....	
Boron (non-Boral).....	
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.....	0
EEE Type 2.....	0
EEE Type 3.....	0
EEE Type 4.....	0
EEE Type 5.....	0
Complexing agents (%wt):	Not yet determined
	(%wt)
EDTA.....	NE
DPTA.....	NE
NTA.....	NE
Polycarboxylic acids.....	NE
Other organic complexants.....	NE
Total complexing agents.....	NE

Type(s) and comment

Expect only trace quantities, if any.

Potential for the waste to contain discrete items: Yes. No

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:

Further treatments not yet determined but assumed to be encapsulation. The waste will be incinerated if possible or high force compaction may be used to condition the waste depending on the oil content and other factors which may affect these methods of treatment.

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: -

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

Waste Packaging for Disposal:

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Container	Stream volume %	Waste loading m ³	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	~10.36	< 1

Other information: -

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): It is not yet determined if the waste meets LLWR's Waste Acceptance Criteria (WAC).

Requires treatment / conditioning to make suitable for disposal at LLWR.

Waste consigned for disposal to LLWR in year of generation: Not yet determined.

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

Uncertainty: Specific activity is a function of station operating history. Present analysis based predominantly on collected samples.

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: Predominantly radiochemical analysis of samples.

Other information: -

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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	1.74E-05	CC 2	3.51E-05	CC 2	Gd 153				
Be 10					Ho 163				
C 14	2.79E-07	CC 2	2.79E-07	CC 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	<1.45E-08	C 3	<1.45E-08	C 3	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40	8.56E-07	CC 2	8.56E-07	CC 2	Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	6.33E-07	CC 2	1.06E-05	CC 2	Pb 205				
Fe 55	4.36E-05	CC 2	3.57E-04	CC 2	Pb 210	<6.15E-07	C 3	<9.35E-07	C 3
Co 60	2.16E-05	CC 2	8.14E-05	CC 2	Bi 208				
Ni 59	2E-05	CC 2	2E-05	CC 2	Bi 210m				
Ni 63	1.96E-05	CC 2	1.96E-05	CC 2	Po 210				
Zn 65	<7.66E-07	C 3	<1.49E-05	C 3	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226	<1.10E-06	C 3	<1.10E-06	C 3
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	4.13E-06	CC 2	5.73E-06	CC 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	<8.41E-08	C 3	<8.41E-08	C 3	Th 234	<5.59E-07	C 3	<1.68E-05	C 3
Mo 93					Pa 231				
Tc 97					Pa 233	<2.61E-07	C 3	<7.82E-06	C 3
Tc 99					U 232	<3.89E-09	C 3	<1.14E-07	C 3
Ru 106	<1.62E-06	C 3	<2.40E-05	C 3	U 233	<4.45E-08	C 3	<4.45E-08	C 3
Pd 107					U 234	1.87E-08	CC 2	1.87E-08	CC 2
Ag 108m					U 235	2.77E-10	CC 2	2.77E-10	CC 2
Ag 110m	<1.53E-07	C 3	<2.91E-06	C 3	U 236	<1.20E-09	C 3	<1.20E-09	C 3
Cd 109					U 238	1.01E-08	CC 2	1.01E-08	CC 2
Cd 113m					Np 237	<4.28E-07	C 3	<4.28E-07	C 3
Sn 119m					Pu 236				
Sn 121m					Pu 238	9.98E-07	CC 2	1.12E-06	CC 2
Sn 123					Pu 239		6		6
Sn 126					Pu 240	<1.87E-06	C 2	<1.87E-06	CC 2
Sb 125	<3.19E-07	C 3	<2.10E-06	C 3	Pu 241	7.05E-05	CC 2	1.30E-04	CC 2
Sb 126					Pu 242	<8.77E-09	C 3	<8.77E-09	C 3
Te 125m					Am 241	2.69E-06	CC 2	2.69E-06	CC 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	3.56E-06	CC 2	3.05E-05	CC 2	Cm 242	1.91E-08	CC 2	4.51E-07	CC 2
Cs 135					Cm 243	1.36E-07	CC 2	1.87E-07	CC 2
Cs 137	2.08E-04	CC 2	2.85E-04	CC 2	Cm 244	1.36E-07	CC 2	2.24E-07	CC 2
Ba 133	7E-07	CC 2	1.55E-06	CC 2	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	<3.82E-07	C 3	<6.75E-06	C 3	Cf 249				
Pm 145					Cf 250				
Pm 147	2.3E-06	CC 2	1.61E-05	CC 2	Cf 251				
Sm 147					Cf 252				
Sm 151	6.24E-07	CC 2	6.93E-07	CC 2	Other a		8		8
Eu 152	<3.35E-07	C 3	<6.39E-07	C 3	Other b/g	3.61E-07	CC 2	3.61E-07	CC 2
Eu 154	1.14E-06	CC 2	2.91E-06	CC 2	Total a	7.47E-06	CC 2	8.27E-06	CC 2
Eu 155	6.73E-07	CC 2	2.75E-06	CC 2	Total b/g	4.21E-04	CC 2	1.08E-03	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