WASTE STREAM 3L16 Active Effluent Filtration Sludges

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.....	39.0 m^3
Future arisings -	1.4.2022 - 31.3.2023.....	4.4 m^3
	1.4.2023 - 31.3.2024.....	4.4 m^3
	1.4.2024 - 31.3.2026.....	4.0 m^3
	1.4.2026 - 31.3.2027.....	2.7 m^3
Total future arisings:		15.5 m^3
Total waste volume:		54.5 m^3

Comment on volumes: Waste volumes will be variable depending on station operating conditions. Rate of arisings changed to reflect recent operational experience.

Uncertainty factors on volumes:

Stock (upper):	x 1.25	Arisings (upper)	x 2.0
Stock (lower):	x 0.75	Arisings (lower)	x 0.5

WASTE SOURCE Filtration of effluent waters.

PHYSICAL CHARACTERISTICS

General description: Sludge, sand and pre-coat materials. There are no large items that may require special handling.

Physical components (%vol): Sludge, sand including filter aid material, spent abrasive material (100% vol). No other items identified. The breakdown of the components constituting the sludge has not been assessed.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m^3): ~1.6

Comment on density: -

CHEMICAL COMPOSITION

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

Chemical state: Neutral

Chemical form of radionuclides: H-3: Tritiated water

Metals and alloys (%wt): Traces of metal as particulate may be present.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	TR		
Other ferrous metals.....	TR		
Iron.....	TR		
Aluminium.....	TR		
Beryllium.....	NE		
Cobalt.....	NE		
Copper.....	TR		
Lead.....	TR		
Magnox/Magnesium.....	0		

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Nickel	NE
Titanium	NE
Uranium	NE
Zinc	TR
Zircaloy/Zirconium	0
Other metals	NE

Organics (%wt): Oil and grease may be present.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	NE		
Paper, cotton	NE		
Wood	NE		
Halogenated plastics	TR		
Total non-halogenated plastics	TR		
Condensation polymers	TR		
Others	TR		
Organic ion exchange materials	0		
Total rubber	0		
Halogenated rubber	0		
Non-halogenated rubber	0		
Hydrocarbons	NE		
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	~0		
Glass/Ceramics	0		
Graphite	0		
Desiccants/Catalysts	0		
Asbestos	0		
Non/low friable			
Moderately friable			

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Highly friable.....	
Free aqueous liquids.....	P
Free non-aqueous liquids.....	0
Powder/Ash.....	0

Inorganic anions (%wt): Only trace quantities expected.

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

Materials of interest for waste acceptance criteria: Expect only trace quantities if any.

	(%wt)	Type(s) and comment
Combustible metals.....	0	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....		
Biodegradable materials.....		
Putrescible wastes.....		
Non-putrescible wastes.....	0	
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....		
Reacting with water.....	0	
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	
Benzene.....	NE	
Chlorinated solvents.....	NE	
Formaldehyde.....	NE	

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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	0
EEE Type 2	0
EEE Type 3	0
EEE Type 4	0
EEE Type 5	0

Complexing agents (%wt): Not yet determined

	(%wt)	Type(s) and comment
EDTA	NE	
DPTA	NE	
NTA	NE	
Polycarboxylic acids	NE	
Other organic complexants	NE	Expect only trace quantities, if any.
Total complexing agents	NE	

Potential for the waste to contain discrete items: No.

TREATMENT, PACKAGING AND DISPOSAL

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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 Recyling / reuse Other / various None	Off-site	100.0

Comment on planned treatments: Waste is stored pending decommissioning stage 1. However, campaigns to retrieve the waste have occurred in the past with latest treatment by incineration.

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: (Not applicable to this waste stream)

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Container	Stream volume %	Waste loading m³	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			

Other information: -

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: -

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: The values quoted were based upon theoretical assessment and limited tank sampling.

Definition of total alpha and total beta/gamma: Results based on sample gross alpha and beta measurements. Gross alpha as Am-241 and Gross beta as K-40.

Measurement of radioactivities: Theoretical estimates and limited tank sampling (K40).

Other information: Other beta/gamma nuclides included (in TBq/m³) in arisings and stocks are: - S35 (2E-4, 3E-7) Ca45 (7E-4, 8E-6); Cr51 (2E-1, 2E-8); Co58 (9E-3, 4E-6); Zr95 (4E-7, 1E-10); Ru103 (1E-7, 6E-13); Ta182 (4E-3, 2E-5); P32 (1E-6, 3E-19); Fe59 (4E-4, 9E-9); Tb160 (3E-7, 2E-10) and Hf181 (2E-7, 3E-12).

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	1.63E-03	C C 1	1.63E-03	C C 1	Gd 153				
Be 10					Ho 163				
C 14	3.95E-06	C C 1	3.95E-06	C C 1	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	<4.48E-08	C 1	<4.48E-08	C 1	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40	<1.38E-06	C 1	<1.38E-06	C 1	Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	3.09E-06	C C 1	3.09E-06	C C 1	Pb 205				
Fe 55	2.56E-05	C C 1	2.56E-05	C C 1	Pb 210	<1.15E-06	C 1	<1.15E-06	C 1
Co 60	4.42E-06	C C 1	4.42E-06	C C 1	Bi 208				
Ni 59					Bi 210m				
Ni 63	9.34E-06	C C 1	9.34E-06	C C 1	Po 210				
Zn 65	<1.92E-07	C 1	<1.92E-07	C 1	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226	<5.28E-06	C 1	<5.28E-06	C 1
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	4.35E-07	C C 1	4.35E-07	C C 1	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	<1.14E-07	C 1	<1.14E-07	C 1	Th 234	<1.39E-06	C 1	<1.39E-06	C 1
Mo 93					Pa 231				
Tc 97					Pa 233	<9.44E-07	C 1	<9.44E-07	C 1
Tc 99					U 232	<3.52E-10	C 1	<3.52E-10	C 1
Ru 106	<7.04E-07	C 1	<7.04E-07	C 1	U 233	<6.88E-10	C 1	<6.88E-10	C 1
Pd 107					U 234	2.98E-08	C C 1	2.98E-08	C C 1
Ag 108m					U 235	1.17E-09	C C 1	1.17E-09	C C 1
Ag 110m	<1.92E-07	C 1	<1.92E-07	C 1	U 236	1.78E-10	C C 1	1.78E-10	C C 1
Cd 109					U 238	2.64E-08	C C 1	2.64E-08	C C 1
Cd 113m					Np 237	<1.01E-06	C 1	<1.01E-06	C 1
Sn 119m					Pu 236				
Sn 121m					Pu 238	7.34E-07	C C 1	7.34E-07	C C 1
Sn 123					Pu 239	7.18E-07	C C 1	7.18E-07	C C 1
Sn 126					Pu 240	7.18E-07	C C 1	7.18E-07	C C 1
Sb 125	<1.02E-06	C 1	<1.02E-06	C 1	Pu 241	4.29E-05	C C 1	4.29E-05	C C 1
Sb 126					Pu 242	<3.68E-09	C 1	<3.68E-09	C 1
Te 125m					Am 241	2.51E-06	C C 1	2.51E-06	C C 1
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	2.72E-06	C C 1	2.72E-06	C C 1	Cm 242	1.06E-07	C C 1	1.06E-07	C C 1
Cs 135					Cm 243	<7.52E-09	C 1	<7.52E-09	C 1
Cs 137	3.13E-04	C C 1	3.13E-04	C C 1	Cm 244	<7.52E-09	C 1	<7.52E-09	C 1
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	<8E-07	C 1	<8E-07	C 1	Cf 249				
Pm 145					Cf 250				
Pm 147	7.2E-07	C C 1	7.2E-07	C C 1	Cf 251				
Sm 147					Cf 252				
Sm 151	3.89E-07	C C 1	3.89E-07	C C 1	Other a				
Eu 152	<7.36E-07	C 1	<7.36E-07	C 1	Other b/g	2.36E-05	C C 1	2.36E-05	C C 1
Eu 154	4.16E-07	C C 1	4.16E-07	C C 1	**Total a**	**1.12E-05**	**C C 1**	**1.12E-05**	**C C 1**
Eu 155	<5.12E-07	C 1	<5.12E-07	C 1	**Total b/g**	**2.07E-03**	**C C 1**	**2.07E-03**	**C C 1**

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