SITE Heysham 2

SITE OWNER **EDFE NGL**

WASTE CUSTODIAN EDFE NGL

WASTE TYPE LLW

Is the waste subject to

Scottish Policy:

WASTE VOLUMES

Reported

31.0 m³

At 1.4.2022..... Stocks: 8.0 m³

Nο

Future arisings -1.4.2022 - 31.3.2027...... 12.0 m³ 1.4.2027 - 31.3.2028...... 17.0 m³

> 1.4.2028 - 31.3.2029...... 66.0 m³ 1.4.2029 - 31.3.2030...... 69.0 m³ 1.4.2030 - 31.3.2031...... 71.0 m³ 1.4.2031 - 31.3.2032...... 74.0 m³

1.4.2033 - 31.3.2038...... $0 \, \text{m}^3$ 1.4.2038 - 31.3.2039...... 4.3 m³

Total future arisings: 344.3 m³

1.4.2032 - 31.3.2033......

Total waste volume: 352.3 m³

Comment on volumes: Waste volumes will be variable depending on station operating conditions.

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

WASTE SOURCE Waste stream covers general solid LLW arisings from dry fuel route operations. The

> following areas are included in this process: Pile Cap including Fuel Machine and Maintenance Bay, Reactor Annex including Gas Bypass Plant, Irradiated Fuel Disposal

Cells, Control Rod Activator/Fuel Plug Unit.

PHYSICAL CHARACTERISTICS

General description: Generally wastes from these areas are mixed materials such as metal items, spent filters,

redundant plant items, cabels, soft waste, wood, heavy duty plastic and rubber waste. Other materials such as asbestos, dried paint, fibre glass, glass, grease, lagging, oily pads, and plaster may be generated. Any free liquids will be removed as far as practical during the sorting process and disposed via an appropriate effluent route. The site does undertake volume reduction by low force compaction, but this is principally to incinerable

Physical components (%wt): Metal (48%), concrete/ rubble (1%), biodegradable non-putrescible (31%), plastics

(halogenated) (4%), plastics (non-halogenated) (5%), Rubber (5%), wood (2%),

powders/ash (2%), others (2%)

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m3): ~0.34

Comment on density: Density based on raw volume and weight at arising as provided in WCH.

CHEMICAL COMPOSITION

General description and components (%wt):

Stainless steel (11%), mild steel (31%), Copper (3%), Alluminium (3%), concrete/rubble (1%), biodegradable non-putrescible (31%), plastics (halogenated) (4%), plastics (non-

halogenated) (5%), Rubber (5%), wood (2%), powders/ash (2%), others (2%)

Chemical state: Neutral

Chemical form of H-3: Tritiated water

radionuclides: C-14: Contamination by activated graphiteand metallic particulate

CI-36: To be determined

Se-79: Not expected to be significant Tc-99: Not expected to be significant

I-129: To be determined

Ra: Not expected to be significant Th: Not expected to be significant

U: To be determined Np: Not expected to be significant

Pu: To be determined

Metals and alloys (%wt): Metal thicknesses will be variable.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14
Stainless steel	~11.0	Metallic plant items/ equipment	activity
Other ferrous metals	~32.0	Mild steel-Metallic plant items/ equipment and drums	
Iron	NE	•	
Aluminium	~3.0	Metallic plant items/ equipment	
Beryllium	NE		
Cobalt	NE		
Copper	~3.0	e.g. cables and piping	
Lead	NE		
Magnox/Magnesium	NE		
Nickel	NE		
Titanium	NE		
Uranium	NE		
Zinc	NE		
Zircaloy/Zirconium	NE		
Other metals	NE		
Organics (%wt): To be further assess	sed.		
	(%wt)	Type(s) and comment	% of total C14
Total cellulosics	~33.0		activity
Paper, cotton	~31.0		
Wood	~2.0		
Halogenated plastics	~4.0		
Total non-halogenated plastics	~5.0		
Condensation polymers	NE		
Others	NE		
Organic ion exchange materials			
Organio ion exchange materials	0		
Total rubber	0 ~5.0		
Total rubber Halogenated rubber	~5.0		
Total rubber Halogenated rubber Non-halogenated rubber	~5.0 NE		
Total rubber Halogenated rubber	~5.0 NE		
Total rubber Halogenated rubber Non-halogenated rubber Hydrocarbons	~5.0 NE		
Total rubber	~5.0 NE		
Total rubber	~5.0 NE		
Total rubber	~5.0 NE		
Total rubber Halogenated rubber Non-halogenated rubber Hydrocarbons Oil or grease Fuel Asphalt/Tarmac (cont.coal tar) Asphalt/Tarmac (no coal tar)	~5.0 NE		
Total rubber Halogenated rubber Non-halogenated rubber Hydrocarbons Oil or grease Fuel Asphalt/Tarmac (cont.coal tar) Asphalt/Tarmac (no coal tar) Bitumen	~5.0 NE		

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	0		2.2
Inorganic sludges and flocs	0		
Soil	NE		
Brick/Stone/Rubble	0		
Cementitious material	~1.0	Concrete/rubble	
Sand	0		
Glass/Ceramics	~~1.0		
Graphite	0		
Desiccants/Catalysts	0		
Asbestos	NE		
Non/low friable			
Moderately friable			
Highly friable			
Free aqueous liquids	0		
Free non-aqueous liquids	0		
Powder/Ash	2.0		
Inorganic anions (%wt): Inorganic anions I	(%wt)	elow 1% of waste, but not assessed Type(s) and comment	
Fluoride	NE		
Chloride	NE		
lodide	NE		
Cyanide	NE		
Carbonate	NE		
Nitrate	NE		
Nitrite	NE		
Phosphate	NE		
Sulphate	NE		
Sulphide	NE		
Materials of interest for Some of the materials waste acceptance criteria:		vaste would burn under appropriate of the following the fo	conditions and plastics
	(%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		

31.0

Non-putrescible wastes.....

	Corrosive materials	0	
	Pyrophoric materials	0	
	Generating toxic gases	0	
	Reacting with water	0	
	Higher activity particles	0	Not expected
	Soluble solids as bulk chemical compounds	0	
Hazardous s	ubstances / - us pollutants:		
		(%wt)	Type(s) and comment
	Acrylamide	NE	71 ()
	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	0	
	Others	NE	
		INC	
	Electronic Electrical Equipment (EEE) EEE Type 1	NE	
		NE	
	EEE Type 2		
	EEE Type 3	NE	
	EEE Type 4	NE	
	EEE Type 5	NE	

Complexing agents (%wt): No

(%wt) Type(s) and comment

0.01

Potential for the waste to contain discrete items:

Yes.

Total complexing agents.....

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)	Off-site	~20.0
Incineration	Off-site	~30.0
Solidification		
Decontamination		
Metal treatment	Off-site	~40.0
Size reduction		
Decay storage		
Recyling / reuse		
Other / various		
None	Off-site	~10.0

Comment on planned treatments:

In line with the waste hierarchy, wastes will be treated preferentially by incineration, metal decontamination/melting, supercompaction, optimal packaging in HHISOs or immobilisation by encapsulation where necessary, prior to ultimate disposal at the LLW Repository. These treatments will be carried out off-site under contract with companies such as LLWR Ltd, Cyclife, Tradebe Inutec.

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	~30.0	
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	~30.0	
Expected to be consigned to a Metal Treatment Facility	~40.0	
Expected to be consigned as Out of Scope		
Expected to be recycled / reused		
Disposal route not known		

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 %			
Disposal Notice	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 Opportunity Stream Opportunity Stream Opportunity Opportu	mated e that Opportunity ortunity Confidence realised Opportunity Confidence realised
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Waste Packaging for Disposal:

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	30.0	~39.1	3

Other information: Waste loading is representative of the raw waste following further planned

treatments. Supercompaction assumed to reduce volume to 20% of original. Solidification assumed to increase volume to 300% of original. No treatment

results in the same volume.

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. Efforts are made to dispose of waste during year of arising, but this is dependent on rate of arising throughout the year. This is also dependent on

consignment of waste to third parties.

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 will be main source of activity with possibly some activation of certain

reactor or fuel route components.

Uncertainty: The main uncertainties in waste stream fingerprints arise from the underlying assumptions

for the fingerprinting process, including in the waste mapping data.

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 beta/gamma emitting radionuclides plus 'other beta/gamma' not listed on the

datasheet.

Measurement of radioactivities:

The total activity has been estimated by applying the fingerprint for the date of arisings. For consignments this will be decayed, but the decay time will vary depending on the storage time for the waste. Therefore, the total given in this WCH is pessimistic, but not considered

overly conservative.

Other information:

	141	ean radioact	tivity, TBq/m³				Mean radioa	ctivity, TBq/m ³	
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	2.25E-05	CC 2	2.25E-05	CC 2	Gd 153	1.4.2022	Outc	anomgo	Code
Be 10	2.202 00	00 2	2.202 00	00 2	Ho 163				
C 14	3.87E-06	CC 2	3.87E-06	CC 2	Ho 166m				
Na 22					Tm 170				
AI 26					Tm 171				
CI 36	4.79E-06	CC 2	4.79E-06	CC 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					TI 204				
Mn 54	6.02E-06	CC 2	6.02E-06	CC 2	Pb 205				
Fe 55	3.58E-04	CC 2	3.58E-04	CC 2	Pb 210				
Co 60	5.19E-05	CC 2	5.19E-05	CC 2	Bi 208				
Ni 59	0.705.05	00 0	0.705.05	00.0	Bi 210m Po 210				
Ni 63	2.72E-05	CC 2 CC 2	2.72E-05 5.61E-07	CC 2 CC 2	Ra 223				
Zn 65 Se 79	5.61E-07	00 2	J.01E-U/	00 2	Ra 225				
Se 79 Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	3.55E-08	CC 2	3.55E-08	CC 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	1.33E-08	CC 2	1.33E-08	CC 2	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99			-		U 232 U 233				
Ru 106	2.48E-08	CC 2	2.48E-08	CC 2	U 234				
Pd 107	4.075.00	00 0	4.075.00	CC 2	U 235				
Ag 108m Ag 110m	1.27E-08 4.82E-07	CC 2 CC 2	1.27E-08 4.82E-07	CC 2	U 236				
Cd 109	4.02L-07	00 2	4.02L-07	00 2	U 238				
Cd 109					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	3.33E-10	CC 2	3.33E-10	CC 2
Sn 123					Pu 239	1.58E-09	CC 2	1.58E-09	CC 2
Sn 126					Pu 240	3.67E-09	CC 2	3.67E-09	CC 2
Sb 125	3.2E-08	CC 2	3.2E-08	CC 2	Pu 241	1.66E-07	CC 2	1.66E-07	CC 2
Sb 126					Pu 242	05.00	00.0	05.00	00.0
Te 125m					Am 241	3E-09	CC 2	3E-09	CC 2
Te 127m					Am 242m Am 243				
l 129	7.075.00	00.0	7.075.00	00.0	Am 243 Cm 242	3.75E-09	CC 2	3.75E-09	CC 2
Cs 134	7.97E-08	CC 2	7.97E-08	CC 2	Cm 242	5.75L-03	JU 2	5.75L-08	00 Z
Cs 135 Cs 137	3 63E 09	CC 2	3 63 = 06	CC 2	Cm 244	1.75E-09	CC 2	1.75E-09	CC 2
Ba 133	3.63E-08 9.42E-09	CC 2	3.63E-08 9.42E-09	CC 2	Cm 245	32 33		32 00	-
La 137	J. 122 UJ		J.72L-UJ	55 2	Cm 246				
La 138					Cm 248				
Ce 144	7.25E-08	CC 2	7.25E-08	CC 2	Cf 249				
Pm 145					Cf 250				
Pm 147	2.92E-07	CC 2	2.92E-07	CC 2	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a	4.05= 5=	00.0	4.00= 0=	00.5
Eu 152	2.11E-08	CC 2	2.11E-08	CC 2	Other b/g	4.98E-07	CC 2	4.98E-07	CC 2
Eu 154	3.24E-08	CC 2	3.24E-08	CC 2	Total a	1.41E-08	CC 2	1.41E-08	CC 2
Eu 155	2.38E-08	CC 2	2.38E-08	CC 2	Total b/g	4.77E-04	CC 2	4.77E-04	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