

WASTE STREAM	4B04	Sludge
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SITE Hunterston B

SITE OWNER EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE CUSTODIAN EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025 = 37.5			
Future arisings:	1.4.2025 - 31.3.2026 = 0.7			
	1.4.2026 - 31.3.2027 = 0.7			
	1.4.2027 - 31.3.2028 = 0.7			
	1.4.2028 - 31.3.2029 = 0.7			
	1.4.2029 - 31.3.2030 = 0.7			
Total future arisings:	3.5			
Total waste volume:	41.0			

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: Waste volumes will be variable depending on decommissioning activities.

Additional information on quantities: -

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper): x 1.50
Stock (lower): x 0.75 Arisings (lower): x 0.50

WASTE SOURCE Waste consists of sludges generated during normal station operation.

PHYSICAL CHARACTERISTICS

General description: The waste consists of sludges including spent precoat, particulate iron, spalled oxide and sand. This waste is not expected to contain any large items. No detailed breakdown available.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.9

Comment on density: The density is estimated.

CHEMICAL COMPOSITION

General description and components (%wt): Sludge composition varies as the waste arises from several sources. The waste is expected to contain silica (sand), precoat filter material, and sludge from various sources. Exact chemical composition details have not been determined.

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0	-	
Other ferrous metals.....	= 0	-	
Iron.....	= 0	-	
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):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~ 0	-	
Paper, cotton.....	~ 0	-	
Wood.....	= 0	-	
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.....	NE	-	
Oil or grease.....	NE	-	
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	-	
Asbestos.....	= 0	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	P	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 0	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

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	-
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	-

Complexing agents (%wt):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	Trace quantities of complexing agents used in the decontamination process may be present.
Total complexing agents.....	NE	-

Physical components:

	Number	Type(s) and comment
Sources.....	= 0	-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....		-
EEE Type 2.....		-
EEE Type 3.....		-
EEE Type 4.....		-
EEE Type 5.....		-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction	On-site	= 100.0
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment		
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments:

-

Conditioning method:

-

Conditioning plants:

Plant Name	Location
Hunterston B Operational Waste Processing Facility (OWPF)	Hunterston B

Likely conditioning matrix:

-

Further information on the conditioning matrix:

A cement blend of BFS/OPC has been considered.

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	3 m³ box (side lifting)	100.0	0.64	2.7	65	-

Range in container waste loading: Waste Loading still to be established. For provisioning purposes the same 50% loading per 500L drum was used in calculating the waste loading for the 3m3 box (with rounded corners). As the waste will initially be grouted into 160L drums and 8 of these will then be placed in the 3m3 box (with rounded corners) the waste loading is established as 0.640m3.

Other information on packaging and conditioning: -

Conditioned density (t/m³): NE
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	= 100.0		
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

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

Opportunities for alternative disposal routing: Yes

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
Near-site NSDF	Incineration facility	= 100.0	AMBER	Based on preliminary characterisation data, however future arisings from defuelling and decommissioning will be added to tanks.

RADIOACTIVITY

Source: There will be contamination by fission products and activation products.

Uncertainty: The estimate of total activity in stocks is within a factor of 10.

Measurement of radioactivities: -

Chemical form of radionuclides: H-3: As Tritiated Water
C-14: Not expected to be significant
Cl-36: Not expected to be significant
Se-79: Not assessed
Tc-99: Not assessed
I-129: Not expected to be significant
Ra: Not expected to be significant
Th: Not assessed
U: Not assessed
Np: Not expected to be significant
Pu: Not assessed

WASTE STREAM 4B04 Sludge									
Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	1.23E-04	C C 1	1.23E-04	C C 1	Gd 153				
Be 10					Ho 163				
C 14	2.50E-05	C C 1	2.50E-05	C C 1	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	1.84E-06	C C 1	1.84E-06	C C 1	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Ti 204				
Mn 54	3.19E-06	C C 1	3.19E-06	C C 1	Pb 205				
Fe 55	2.92E-04	C C 1	2.92E-04	C C 1	Pb 210				
Co 60	2.59E-04	C C 1	2.59E-04	C C 1	Bi 208				
Ni 59					Bi 210m				
Ni 63	3.55E-04	C C 1	3.55E-04	C C 1	Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	2.38E-06	C C 1	2.38E-06	C C 1	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235	3.10E-09	C C 1	3.10E-09	C C 1
Ag 110m					U 236				
Cd 109					U 238	2.00E-08	C C 1	2.00E-08	C C 1
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	7.52E-06	C C 1	7.52E-06	C C 1
Sn 123					Pu 239	1.54E-05	C C 1	1.54E-05	C C 1
Sn 126					Pu 240	1.54E-05	C C 1	1.54E-05	C C 1
Sb 125					Pu 241	3.04E-04	C C 1	3.04E-04	C C 1
Sb 126					Pu 242				
Te 125m					Am 241	3.18E-05	C C 1	3.18E-05	C C 1
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	7.66E-07	C C 1	7.66E-07	C C 1	Am 242	1.04E-07	C C 1	1.04E-07	C C 1
Cs 135					Cm 243	6.28E-07	C C 1	6.28E-07	C C 1
Cs 137	2.24E-04	C C 1	2.24E-04	C C 1	Cm 244	6.28E-07	C C 1	6.28E-07	C C 1
Ba 133					Cm 245	1.87E-07	C C 1	1.87E-07	C C 1
La 137					Cm 246	1.87E-07	C C 1	1.87E-07	C C 1
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147	1.21E-05	C C 1	1.21E-05	C C 1	Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152					Unsp b/g	2.69E-06	C C 1	2.69E-06	C C 1
Eu 154	4.27E-06	C C 1	4.27E-06	C C 1	Total a	7.20E-05	*	7.20E-05	*
Eu 155	1.14E-06	C C 1	1.14E-06	C C 1	Total b/g	1.61E-03	*	1.61E-03	*

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 the 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
* Total calculated from the 114 declared radionuclides