

WASTE STREAM	2X33	Magnox Fuel Reprocessing Plant - Plutonium Areas
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SITE Sellafield

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Ltd

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 0		
Future arisings:	1.4.2025 - 31.3.2026	= 16.8		
	1.4.2026 - 31.3.2027	= 16.8		
	1.4.2027 - 31.3.2028	= 16.8		
	1.4.2028 - 31.3.2029	= 16.8		
	1.4.2029 - 31.3.2030	= 16.8		
	1.4.2030 - 31.3.2031	= 16.8		
	1.4.2031 - 31.3.2032	= 16.8		
Total future arisings:		117.4		
Total waste volume:		117.4		

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

Comment on arising rates: Arisings are based on 5 years of forecasts, with the final year extrapolated to the end of the lifetime of the waste stream.

Additional information on quantities: Uncertainty information is notional.

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

WASTE SOURCE Waste is generated from routine plant operations and maintenance from the Magnox Fuel Reprocessing plant Plutonium areas.

PHYSICAL CHARACTERISTICS

General description: The waste will mainly consist of secondary wastes (such as PPE) and metallic waste from redundant plant items.

Changes since waste generated: The waste has not undergone any changes since it was generated.

Bulk density (t/m³): = 0.27

Comment on density: The total bulk density has been calculated based on the 5 year forecast and relevant waste characterisation document.

CHEMICAL COMPOSITION

General description and components (%wt): Metals (50.5%), Concrete/Rubble (1%), Wood (1%), Rubber (1%), Halogenated Plastics (19.9%), Non-Halogenated Plastics (19.9%), Hydrocarbons (3.6%), Other Organics (1%), Asbestos (1.6%) and Other (0.5%).

Chemical state: Neutral

Sheet metal proportion / thickness: Metal thickness not specified.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 3.2	-	
Other ferrous metals.....	= 8.0	-	
Iron.....	= 19.9	-	
Aluminium.....	= 2.0	-	
Beryllium.....		-	
Cobalt.....		-	
Copper.....	= 0.92	-	
Lead.....	= 5.2	-	
Magnox/Magnesium.....		-	
Nickel.....		-	
Titanium.....		-	
Uranium.....		-	
Zinc.....	= 1.3	-	
Zircaloy/Zirconium.....		-	
Other metals.....	= 10.1	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	= 1.0	-	
Paper, cotton.....		-	
Wood.....	= 1.0	-	
Halogenated plastics.....	= 19.9	-	
Total non-halogenated plastics.....	= 19.9	-	
Condensation polymers.....		-	
Others.....		-	
Organic ion exchange materials.....		-	
Total rubber.....	= 1.0	-	
Halogenated rubber.....		-	
Non-halogenated rubber.....		-	
Hydrocarbons.....	= 3.6	-	
Oil or grease.....	= 2.7	-	
Fuel.....		-	
Asphalt/Tarmac (cont.coal tar).....	= 0.67	-	
Asphalt/Tarmac (no coal tar).....		-	
Bitumen.....	= 0.27	-	
Others.....		-	
Other organics.....	= 1.0	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....		-	
Inorganic sludges and flocs.....		-	
Soil.....		-	
Brick/Stone/Rubble.....	= 1.0	-	
Cementitious material.....		-	
Sand.....		-	
Glass/Ceramics.....	= 0.53	-	
Graphite.....		-	
Desiccants/Catalysts.....		-	
Asbestos.....	= 1.6	-	
Non/low friable.....	= 1.1	-	
Moderately friable.....	= 0.27	-	
Highly friable.....	= 0.27	-	
Free aqueous liquids.....		-	
Free non-aqueous liquids.....		-	
Powder/Ash.....		-	

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

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....		-
Low flash point liquids.....		-
Explosive materials.....		-
Phosphorus.....		-
Hydrides.....		-
Biological etc. materials.....		-
Biodegradable materials.....	= 1.0	-
Putrescible wastes.....		-
Non-putrescible wastes.....	= 1.0	-
Corrosive materials.....		-
Pyrophoric materials.....		-
Generating toxic gases.....		-
Reacting with water.....	= 3.3	-
Higher activity particles.....		-
Soluble solids as bulk chemical compounds.....		-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	= 1.3	-
Benzene.....		-
Chlorinated solvents.....		-
Formaldehyde.....		-
Organometallics.....		-
Phenol.....		-
Styrene.....		-
Tri-butyl phosphate.....		-
Other organophosphates.....		-
Vinyl chloride.....		-
Arsenic.....		-
Barium.....		-
Boron.....		-
Boron (in Boral).....		-
Boron (non-Boral).....		-
Cadmium.....		-
Caesium.....		-
Selenium.....		-
Chromium.....		-
Molybdenum.....		-
Thallium.....		-
Tin.....		-
Vanadium.....		-
Mercury compounds.....		-
Others.....		-

Complexing agents (%wt):

Yes		
	(%wt)	Type(s) and comment
EDTA.....	< 0.01	-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....		-
Total complexing agents.....	< 0.01	-

Physical components:

	Number	Type(s) and comment
Sources.....	= 0	-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....		475 items every 5 years
EEE Type 2.....		383 items every 5 years
EEE Type 3.....		383 items every 5 years
EEE Type 4.....		383 items every 5 years
EEE Type 5.....		192 items every 5 years

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction	On-site	= 21.2
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation	Off-site	= 66.2
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	Off-site	= 0.6
Treatment not yet determined		
None		
		= 11.9

Comments on planned treatments:

For inventory purposes, it is assumed that super-compaction will continue after the closure of WAMAC in 2028. Metal treatment will take place off site, incineration will take place off site. Waste not requiring treatment is non compactable LLW for direct disposal to LLWR.

Conditioning method:

-

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

Further information on the conditioning matrix:

-

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	11.9	10.0	18.3	2	-
	1/2 Height WAMAC IP-2 ISO (TC08)	21.2	59.3	18.8	1	-

Range in container waste loading:

Other information on packaging and conditioning: -

Conditioned density (t/m³): -

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)			
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	= 33.1	= 0.52	2025
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	= 66.2	= 0.14	2025
Expected to be consigned to a Metal Treatment Facility	= 0.6	= 1.4	2025
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: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: The activity arises from the reprocessing of Magnox fuel. The waste is contaminated as a result of routine operations.

Uncertainty: The uncertainty associated with the derived fingerprint is likely to be relatively low, however the volumes and total activity information (and possibly some other assumptions) are likely to be more notional and thus more uncertain.

Measurement of radioactivities: Specific activity data is based on data in the corresponding WCH, which in turn maps an estimated total activity to an analytically derived radionuclide fingerprint.

Chemical form of radionuclides:

- H-3: -
- C-14: -
- Cl-36: -
- Se-79: -
- Tc-99: -
- I-129: -
- Ra: -
- Th: -
- U: -
- Np: -
- Pu: -

WASTE STREAM		2X33		Magnox Fuel Reprocessing Plant - Plutonium Areas						
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			=	1.15E-06	C C 2	Gd 153				
Be 10										
C 14			=	1.44E-07	C C 2	Ho 163				
Na 22						Ho 166m				
Al 26						Tm 170				
Cl 36						Tm 171				
Ar 39						Lu 174				
Ar 42						Lu 176				
K 40						Hf 178n				
Ca 41						Hf 182				
Mn 53						Pt 193				
Mn 54						Tl 204				
Fe 55						Pb 205				
Co 60						Pb 210				
Ni 59						Bi 208				
Ni 63						Bi 210m				
Zn 65						Po 210				
Se 79						Ra 223				
Kr 81						Ra 225				
Kr 85						Ra 226				
Rb 87				Ra 228						
Sr 90			=	2.27E-06	C C 2	Ac 227				
Zr 93						Th 227				
Nb 91						Th 228				
Nb 92						Th 229				
Nb 93m						Th 230				
Nb 94						Th 232				
Mo 93						Th 234				
Tc 97						Pa 231				
Tc 99			=	1.22E-06	C C 2	Pa 233				
Ru 106						U 232				
Pd 107						U 233				
Ag 108m						U 234		= 1.76E-07 C C 2		
Ag 110m						U 235		= 1.60E-08 C C 2		
Cd 109						U 236				
Cd 113m						U 238		= 1.60E-07 C C 2		
Sn 119m						Np 237				
Sn 121m						Pu 236				
Sn 123						Pu 238		= 6.26E-06 C C 2		
Sn 126						Pu 239		= 1.12E-05 C C 2		
Sb 125						Pu 240		= 1.12E-05 C C 2		
Sb 126						Pu 241		= 1.01E-04 C C 2		
Te 125m						Pu 242				
Te 127m						Am 241		= 2.45E-05 C C 2		
I 129						Am 242m				
Cs 134						Am 243				
Cs 135						Cm 242		= 1.92E-07 C C 2		
Cs 137						Cm 243		= 1.60E-08 C C 2		
Ba 133			=	5.12E-07	C C 2	Cm 244		= 2.88E-07 C C 2		
La 137						Cm 245				
La 138						Cm 246				
Ce 144						Cm 248				
Pm 145						Cf 249				
Pm 147						Cf 250				
Sm 147						Cf 251				
Sm 151						Cf 252				
Eu 152						Unsp a				
Eu 154						Unsp b/g				
Eu 155						Total a	0	*		
						Total b/g	0	*		
								5.39E-05 *		
								1.06E-04 *		

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