

WASTE STREAM	9F323	Ponds and Effluent Treatment Plant LLW
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SITE Sizewell A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE LLW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	0 m ³
Future arisings -	1.4.2092 - 31.3.2096.....	282.2 m ³
Total future arisings:		282.2 m ³
Total waste volume:		282.2 m ³

Comment on volumes: Volumes stated assume waste has been removed from the system and size corrected awaiting further treatment and disposal. This work will occur during Final Site Clearance. Final Dismantling & Site Clearance is assumed to commence in 2088 with reactor dismantling commencing in 2092 and lasting for 3 years. The volumes and radioactivity have been calculated for 85 years after reactor shutdown, i.e. 2091.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.2
 Stock (lower): x Arisings (lower) x 0.8

WASTE SOURCE Final Site Clearance processes and procedures.

PHYSICAL CHARACTERISTICS

General description: Hard and soft trash arising from the pond/effluent treatment plant areas including metal, plastic, paper, glass, rubber and occasionally HEPA filters, also contaminated soil. Any large items will be cut to fit standard packages.

Physical components (%vol): Metallic trash (~36%vol), plastics (~13%vol), concrete/rubble (~50%vol) and wood (<1%wt).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~4.33

Comment on density: Density estimate based on average weight and volume of packages. Bulk density has been based on the assumed density of ABS as 1.04 t/m³, concrete 2.4 t/m³, metal 7.9 t/m³, plastic 1.3 t/m³, and wood 0.5 t/m³

CHEMICAL COMPOSITION

General description and components (%wt): The waste consists of metals, various plastics including polythene, concrete and rubble and a small amount of wood. Metallic trash (~36%vol), plastics (~13%vol), concrete/rubble (~50%vol) and wood (<1%vol).

Chemical state: Neutral

Chemical form of radionuclides: H-3: Tritium present as surface contamination of waste by tritiated liquor.
 C-14: Carbon 14 may be present as contamination in the form of graphite dust.
 Cl-36: Chlorine 36 may be present as a contaminant of graphite dust.
 Se-79: The selenium-79 content is insignificant.
 Tc-99: The technetium-99 content is insignificant.
 Ra: The radium isotope content is insignificant.
 Th: The thorium content is insignificant.
 U: The uranium isotope content is insignificant.
 Np: The neptunium isotope content is insignificant.
 Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): 200 litre drums have wall thickness of about 1 mm.

WASTE STREAM

9F323

Ponds and Effluent Treatment Plant LLW

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	18.0	Nickel and chromium in stainless steel.	
Other ferrous metals.....	18.0	Generally carbon steels with a small percentage of 300 series steels.	
Iron.....			
Aluminium.....	NE		
Beryllium.....	0		
Cobalt.....			
Copper.....	NE		
Lead.....	NE		
Magnox/Magnesium.....	TR		
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....	NE		
Zircaloy/Zirconium.....	0		
Other metals.....	0	"Other" metals have not been identified.	

Organics (%wt):

The waste will contain cellulose in the form of paper. Halogenated plastics and rubbers are expected to be present.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	<1.0		
Paper, cotton.....	0		
Wood.....	<1.0		
Halogenated plastics	<13.0		
Total non-halogenated plastics.....	<0		
Condensation polymers.....	NE		
Others.....	NE		
Organic ion exchange materials....	0		
Total rubber.....	~0		
Halogenated rubber	~0		
Non-halogenated rubber.....	~0		
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	TR		

Other materials (%wt):

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WASTE STREAM

9F323

Ponds and Effluent Treatment Plant LLW

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....			
Brick/Stone/Rubble.....	0		
Cementitious material.....	50.0		
Sand.....			
Glass/Ceramics.....	TR		
Graphite.....	0		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

Inorganic anions (%wt): Possibly present in trace quantities.

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

Materials of interest for waste acceptance criteria: May contain traces of unreacted Magnox. Magnox will ignite under appropriate conditions.

	(%wt)	Type(s) and comment
Combustible metals.....	TR	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	0	
Biodegradable materials.....		
Putrescible wastes.....	0	
Non-putrescible wastes.....		

WASTE STREAM**9F323****Ponds and Effluent Treatment Plant LLW**

Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	TR
Reacting with water.....	TR
Higher activity particles.....	
Soluble solids as bulk chemical compounds.....	

Hazardous substances / non hazardous pollutants: None expected, except possibly in trace quantities.

	(%wt)	Type(s) and comment
Acrylamide.....		
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.....		
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

WASTE STREAM**9F323****Ponds and Effluent Treatment Plant LLW**

Complexing agents (%wt): Yes

(%wt) Type(s) and comment

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants.....

Total complexing agents..... TR

Potential for the waste to contain discrete items:

Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs; All stainless items assumed DIs. NB if recycled then DI Limits n/a. Large Concrete Items (LCIs) may be DIs; drummed (ungrouted)/"rubbleised" wastes assumed NOT DIs.

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)		
Incineration		1.0
Solidification		
Decontamination		
Metal treatment		30.0
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		69.0

Comment on planned treatments:

It is expected that 30% of this waste stream will be sent for Metal Recycle, 69% VLLW Landfill and 1% 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	69.0	
Expected to be consigned to an On-Site Disposal Facility		
Expected to be consigned to an Incineration Facility	1.0	
Expected to be consigned to a Metal Treatment Facility	30.0	
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:

17 04 05, 17 01 01, 17 02 03

Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):

WASTE STREAM**9F323****Ponds and Effluent Treatment Plant LLW**

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)

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			

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: Activation and contamination of materials.

Uncertainty: Activity values are current best estimates. Specific activity is a function of Station operating history. The values quoted are indicative of the activities that would be expected.

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'.

WASTE STREAM

9F323

Ponds and Effluent Treatment Plant LLW

Measurement of
radioactivities: .

Other information: -

WASTE STREAM

9F323

Ponds and Effluent Treatment Plant LLW

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			6.21E-09	CC 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			9.49E-08	CC 2	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			5.06E-08	CC 2	Lu 174				8
Ar 39				8	Lu 176				8
Ar 42				8	Hf 178n				8
K 40				8	Hf 182				8
Ca 41				8	Pt 193				8
Mn 53				8	Tl 204				8
Mn 54				8	Pb 205				8
Fe 55			3.69E-16	CC 2	Pb 210				8
Co 60			7.06E-13	CC 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			2.88E-08	CC 2	Po 210				8
Zn 65				8	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226				8
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90			2.67E-07	CC 2	Th 227				8
Zr 93				8	Th 228				8
Nb 91				8	Th 229				8
Nb 92				8	Th 230				8
Nb 93m				8	Th 232				8
Nb 94			1.49E-09	CC 2	Th 234				8
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99				8	U 232				8
Ru 106			1.59E-32	CC 2	U 233				8
Pd 107				8	U 234		2.21E-09	CC 2	
Ag 108m			2.29E-09	CC 2	U 235		5.86E-09	CC 2	
Ag 110m				8	U 236		3.03E-08	CC 2	
Cd 109				8	U 238		5.28E-08	CC 2	
Cd 113m				8	Np 237			8	
Sn 119m				8	Pu 236			8	
Sn 121m				8	Pu 238		2.13E-08	CC 2	
Sn 123				8	Pu 239		3.22E-08	CC 2	
Sn 126				8	Pu 240		4.89E-08	CC 2	
Sb 125			2.9E-17	CC 2	Pu 241		3.38E-08	CC 2	
Sb 126				8	Pu 242			8	
Te 125m				8	Am 241		6.74E-08	CC 2	
Te 127m				8	Am 242m			8	
I 129				8	Am 243			8	
Cs 134			2.24E-19	CC 2	Cm 242			8	
Cs 135				8	Cm 243		2.24E-11	CC 2	
Cs 137			1.55E-06	CC 2	Cm 244		2E-10	CC 2	
Ba 133			3.1E-11	CC 2	Cm 245			8	
La 137				8	Cm 246			8	
La 138				8	Cm 248			8	
Ce 144			1.46E-39	CC 2	Cf 249			8	
Pm 145				8	Cf 250			8	
Pm 147			6.4E-17	CC 2	Cf 251			8	
Sm 147				8	Cf 252			8	
Sm 151				8	Other a				
Eu 152			2.06E-10	CC 2	Other b/g				
Eu 154			3.49E-11	CC 2	Total a	0	2.61E-07	CC 2	
Eu 155			2.73E-13	CC 2	Total b/g	0	2.04E-06	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