

WASTE STREAM	9H324	Flask Handling Area and AETP LLW
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SITE Wylfa
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 -	1.4.2101 - 31.3.2106.....	77.9 m ³
Total future arisings:		77.9 m ³
Total waste volume:		77.9 m ³

Comment on volumes: Waste has been deferred from C&M Prep Waste stream 9H912 to FSCFinal Dismantling & Site Clearance is assumed to commence in 2097 with reactor dismantling commencing in 2101 and lasting for 5 years. The volumes and radioactivity have been calculated for 85 years after reactor shutdown, i.e. 2100.

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

WASTE SOURCE Waste which has been deferred from Care and Maintenance preparations and procedures in the areas covered by this waste stream.

PHYSICAL CHARACTERISTICS

General description: Hard trash and redundant equipment. No large items are expected.
 Physical components (%vol): Scrap metal from pumps, valves, pipework and steel drums. Metal (21% vol), plastic (5% vol), paper/cloth (43% vol), soft organics (14% vol), concrete (7% vol), wood (2% vol) and misc(6%).
 Sealed sources: The waste does not contain sealed sources.
 Bulk density (t/m³): ~0.4
 Comment on density: Density is based on the typical weight of a 200 litre drum.

CHEMICAL COMPOSITION

General description and components (%wt): The waste contains metals, including aluminium and steel, various plastics, paper and wood. Metal (21% vol), plastic (5% vol), paper/cloth (43% vol), soft organics (14% vol), concrete (7% vol), wood (2% vol) and misc(6%).
 Chemical state: Neutral
 Chemical form of radionuclides: H-3: The chemical form of tritium has not been determined.
 C-14: The chemical form of carbon 14 has not been determined.
 Cl-36: Chemical form of chlorine 36 has not been determined.
 Se-79: The selenium content is insignificant.
 Tc-99: The technetium content is insignificant.
 Ra: Radium isotope content is expected to be insignificant.
 Th: The thorium content is insignificant.
 U: Chemical form of uranium isotopes has not been determined but may be uranium oxides.
 Np: The neptunium content is insignificant.
 Pu: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.
 Metals and alloys (%wt): Metal thickness will be variable from about 1 mm up to about 30 mm.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~4.0	Nickel and chromium will be present in stainless steel.	
Other ferrous metals.....	~16.0		
Iron.....			

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Aluminium.....	<1.0	
Beryllium.....	0	
Cobalt.....		
Copper.....	0	
Lead.....	0	
Magnox/Magnesium.....	0	
Nickel.....	P	present in stainless steel.
Titanium.....		
Uranium.....		
Zinc.....	0	
Zircaloy/Zirconium.....	0	
Other metals.....	P	chromium will be present in stainless steel. No "other" metals expected.

Organics (%wt): Cellulosic materials, halogenated plastics expected.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	45.0		
Paper, cotton.....	43.0		
Wood.....	2.0		
Halogenated plastics	5.0	PVC and neoprene.	
Total non-halogenated plastics.....	6.0		
Condensation polymers.....	NE		
Others.....	6.0		
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.....	~14.0		

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	~0		
Cementitious material.....	~7.0		
Sand.....			

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Glass/Ceramics.....	0
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): Trace quantities of inorganic anions are anticipated.

	(%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: No materials likely to pose a fire or other non-radiological hazard have been identified.

	(%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.....		
Putrescible wastes.....	0	
Non-putrescible wastes.....		
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

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Hazardous substances / None expected
 non hazardous pollutants:

	(%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.....		

Complexing agents (%wt): Yes

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

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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 (ungrounted)/"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		65.0
Solidification		
Decontamination		
Metal treatment		20.0
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		15.0

Comment on planned treatments:

-

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	15.0	
Expected to be consigned to an On-Site Disposal Facility		
Expected to be consigned to an Incineration Facility	65.0	
Expected to be consigned to a Metal Treatment Facility	20.0	
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, 20 01 01, 17 02 03

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 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: Contamination by activation products and fission products.

Uncertainty: Activity estimates are as shown in the radionuclide table.

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'.

Measurement of radioactivities: -

Other information: It is expected that this Waste will become Out of Scope by FSCThe activities quoted are those at 85 years after reactor shutdown, i.e. in 2100. There may be some contamination by Cs137.

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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			6.46E-07	CC 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			8.01E-07	CC 2	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			1.75E-06	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				8	Pb 210				8
Co 60				8	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			3.63E-06	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			2.98E-05	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			1.34E-07	CC 2	Th 234		3.13E-09	CC 2	8
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99				8	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234		2.94E-09	CC 2	8
Ag 108m			1.53E-07	CC 2	U 235				8
Ag 110m				8	U 236				8
Cd 109				8	U 238		3.13E-09	CC 2	8
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238		7.43E-07	CC 2	8
Sn 123				8	Pu 239		1.32E-06	CC 2	8
Sn 126				8	Pu 240		1.72E-06	CC 2	8
Sb 125				2	Pu 241		7.96E-07	CC 2	8
Sb 126				8	Pu 242				8
Te 125m				8	Am 241		3.58E-06	CC 2	8
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134				2	Cm 242				8
Cs 135				8	Cm 243				8
Cs 137			1.98E-05	CC 2	Cm 244		5.22E-09	CC 2	8
Ba 133				8	Cm 245				8
La 137				8	Cm 246				8
La 138				8	Cm 248				8
Ce 144				8	Cf 249				8
Pm 145				8	Cf 250				8
Pm 147				8	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151				8	Other a				8
Eu 152			4.59E-09	CC 2	Other b/g				8
Eu 154			1.27E-09	CC 2	Total a	0	7.37E-06	CC 2	8
Eu 155				2	Total b/g	0	5.75E-05	CC 2	8

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