

WASTE STREAM	9G106	Ponds LLW
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SITE Trawsfynydd
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 -	1.4.2022 - 31.3.2028.....	~533.6 m ³
Total future arisings:		533.6 m ³
Total waste volume:		533.6 m ³
Comment on volumes:	The rate of arising of this stream will not be uniform over the period of Care and Maintenance Preparations.	
Uncertainty factors on volumes:	Stock (upper): x	Arisings (upper) x 1.2
	Stock (lower): x	Arisings (lower) x 0.8

WASTE SOURCE The Ponds waste stream captures plant, equipment, structural materials and secondary waste arising from decommissioning of the wet fuel route.

PHYSICAL CHARACTERISTICS

General description: The waste consists of predominantly deplanting wastes and associated secondary wastes. Items include deplanted equipment and components, pipework, valves, pipe fittings, pumps, pump hosing, tanks, ducting, drums, sieves, gauges, motors, cable trays, frames, ducting, scaffolding, concretes, WEEE.

Physical components (%wt): Composition is typically metals (~52%), concrete/rubble (~21%), soil (~1%), plastics (~13%), rubber (~2%), wood (~1%), other organics (~8%) and others (2%). This breakdown is likely to change as decommissioning progresses.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 0.65

Comment on density: WCH mass divided by volume

CHEMICAL COMPOSITION

General description and components (%wt): The waste also comprises metals (~52%), concrete/rubble (~21%), soil (~1%), plastics (~13%), rubber (~2%), wood (~1%), other organics (~8%) and others (2%).

Chemical state: Neutral

Chemical form of radionuclides: H-3: Most tritium is expected to be present as water but some may be in the form of other inorganic compounds or as organic compounds.
C-14: Carbon 14 will probably be present as graphite.
Cl-36: The 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 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): Not assessed.

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	1.9	Stainless steel standard grade : Drums, tanks, graphex bag cradles, containers, flanges and pipework	
Other ferrous metals.....	44.0	Mild Steel standard grade de-plant equipment including tanks,pumps,air blowers,pipework,flanges,valves,siev es, ducting,presure gauges,fans,motors,cable trays,vent ducting and 50 no of Hepa filters.	
Iron.....			
Aluminium.....	1.1	Scaffolding, deplanted equipment/components	
Beryllium.....			
Cobalt.....			
Copper.....	0.28	Pipework, cabling, deplanted equipment/components	
Lead.....	4.4	Tank, shielding 124kg paint dust containing typically less than 1.24kg (1%) of lead	
Magnox/Magnesium.....	0.01	Dust contained within vac bags generated from operational processes	
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....	~0.02	Zinc coating of thin wire mesh of steel - 50 no of Hepa filters	
Zircaloy/Zirconium.....			
Other metals.....			
Organics (%wt):		The waste contains halogenated plastic as PVC, non-halogenated plastic as polythene, halogenated rubber as neoprene and non-halogenated rubber as silicone. Other organics may be present as oils and oily sludge.	
	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	1.0		
Paper, cotton.....			
Wood.....	1.0		
Halogenated plastics	7.7	Pipework, pumps,valves, tanks , ducting, sheeting,	
Total non-halogenated plastics.....	5.3		
Condensation polymers.....	0		
Others.....	5.3	Soft waste, PPE, takki rags, sample pots, pipework, scaffolding boards, visqueen, poly bags, hosing	
Organic ion exchange materials....	0.01	Lewatit TP-207 ion exchange resin	
Total rubber.....	2.0		
Halogenated rubber	1.0		
Non-halogenated rubber.....	1.0		
Hydrocarbons.....			

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Oil or grease
 Fuel.....
 Asphalt/Tarmac (cont.coal tar)...
 Asphalt/Tarmac (no coal tar)....
 Bitumen.....
 Others.....
 Other organics.....

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..			
Inorganic sludges and flocs.....	7.6	Sludge	
Soil.....	1.0		
Brick/Stone/Rubble.....			
Cementitious material.....	21.0	Concrete/rubble	
Sand.....			
Glass/Ceramics.....			
Graphite.....			
Desiccants/Catalysts.....			
Asbestos.....	<0.74		
Non/low friable.....	<0.74	Asbestos content analysed on a consignment basis and detailed on the WCI for VLLW disposal and incineration.	
Moderately friable.....	0		
Highly friable.....	0		
Free aqueous liquids.....			
Free non-aqueous liquids.....			
Powder/Ash.....	0.20	Concrete dust (0.13%), Plaster dust (0.03%), Magnesium oxide (0.01%), Paint dust (0.04%)	

Inorganic anions (%wt): Fluorides, carbonates, chlorides, sulphates, phosphates may be present in trace quantities. Other anions may be aluminates and silicates associated with the cement encapsulating the oily sludge.

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

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Materials of interest for waste acceptance criteria: Asbestos may be present in very small quantities (from thermal insulation).

	(%wt)	Type(s) and comment
Combustible metals.....		
Low flash point liquids.....		
Explosive materials.....		
Phosphorus.....		
Hydrides.....		
Biological etc. materials.....		
Biodegradable materials.....	0	
Putrescible wastes.....		
Non-putrescible wastes.....		
Corrosive materials.....		
Pyrophoric materials.....		
Generating toxic gases.....		
Reacting with water.....	P	486m2
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

Hazardous substances / non hazardous pollutants: Asbestos (<<1% wt). Lead may be present 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.....	0	
Boron (in Boral).....		
Boron (non-Boral).....		
Cadmium.....		
Caesium.....		
Selenium.....		
Chromium.....		
Molybdenum.....		
Thallium.....		

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Tin.....

Vanadium.....

Mercury compounds.....

Others.....

Electronic Electrical Equipment (EEE)

EEE Type 1..... 64 mixed electrical equipment, components and fans.

EEE Type 2.....

EEE Type 3..... 63 vacuum cleaners , portable vent extracts units, HP instruments: icams AB96's .

EEE Type 4.....

EEE Type 5.....

Complexing agents (%wt): Yes

(%wt) Type(s) and comment

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants..... 0.01 Decon-90 will be soaked into takki rags and used for manual plant item cleaning and will be disposed of via incineration route.

Total complexing agents..... 0.01

Potential for the waste to contain discrete items: Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs; Stainless items assumed DIsLarge Concrete Items (LCIs) may be DIs; drummed (ungrouded)/"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	On-site	3.2
Supercompaction (HFC)	Off-site	3.2
Incineration	Off-site	36.4
Solidification		
Decontamination		
Metal treatment	Off-site	3.9
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		56.5

Comment on planned treatments: 34% of the stream is planned to be disposed of as VLLW to landfill

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Disposal Routes:	Disposal Route	Stream volume %	Disposal density t/m3
		Expected to be consigned to the LLW Repository	25.7
	Expected to be consigned to a Landfill Facility	34.0	0.65
	Expected to be consigned to an On-Site Disposal Facility		
	Expected to be consigned to an Incineration Facility	36.4	0.40
	Expected to be consigned to a Metal Treatment Facility	3.9	1.4
	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 07, 17 05 03*/04, 17 01 01, 17 02 03, 130208*, 15 02 02*

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:

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	~3.2	43.2	< 1
1/2 Height IP-2 Disposal/Re-usable ISO	~22.5	10	13
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: Data has been presented as though the waste will be in dedicated containers. It is likely that this waste will be placed in a container with other LLW. 43.2m³ loading volume is calculated based on the fact that you can low force compact two times the normal volume of waste into a 200 litre/0.2m³ drum (400 litres/0.4m³), you can then fit 36 drums (14.4m³) into a 1/2 height ISO, each drum can be super-compacted to a 1/3 of its original volume so therefore we can get 3 x the amount of un-compacted drums into the final disposal container (43.2m³).

Waste Planned for Disposal at the LLW Repository:

Container voidage: Significant inaccessible voidage is not expected.

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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: Yes.

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: Activity is from a mixture of fission and activation products and actinides. Tritium is also present.

Uncertainty: The values quoted are derived from available measurements and are indicative of the activities that might 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'.

Measurement of radioactivities: Data taken from WCH - 1MXN-3TRA-0-WCH-0-4740 V4 decayed by one year for RWI 2022

Other information: -

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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			9.55E-08	CC 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			7.62E-09	CC 2	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			2.08E-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				8	Pb 210				8
Co 60			1.43E-09	CC 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			1.42E-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			6.73E-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				8	Th 234		6.61E-08	CC 2	
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99			8.86E-09	CC 2	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234		5.65E-08	CC 2	
Ag 108m			1.15E-09	CC 2	U 235		1.5E-09	CC 2	
Ag 110m				8	U 236				8
Cd 109				8	U 238		6.61E-08	CC 2	
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238		6.33E-06	CC 2	
Sn 123				8	Pu 239		8.87E-06	CC 2	
Sn 126				8	Pu 240		1.14E-05	CC 2	
Sb 125				8	Pu 241		1.27E-04	CC 2	
Sb 126				8	Pu 242				8
Te 125m				8	Am 241		3.9E-05	CC 2	
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134			1.88E-09	CC 2	Cm 242				8
Cs 135				8	Cm 243		4.19E-08	CC 2	
Cs 137			1.55E-04	CC 2	Cm 244		5.06E-07	CC 2	
Ba 133				8	Cm 245		3.3E-07	CC 2	
La 137				8	Cm 246		3.14E-08	CC 2	
La 138				8	Cm 248				8
Ce 144				8	Cf 249				8
Pm 145				8	Cf 250				8
Pm 147			6.27E-08	CC 2	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151			2.61E-07	CC 2	Other a				
Eu 152			1.77E-09	CC 2	Other b/g				
Eu 154			3.65E-09	CC 2	Total a	0	6.66E-05	CC 1	
Eu 155				8	Total b/g	0	3.5E-04	CC 1	

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