

WASTE STREAM	2D43	Pond Skips
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SITE Sellafield
SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Limited

WASTE TYPE LLW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	332.8 m ³
Total future arisings:		0 m ³
Total waste volume:		332.8 m ³

Comment on volumes: There are no current or future arisings of skips into the pond. The stock volume is based on a skip envelope disposal volume of 7.08m³ and the 31st March 2022 figure of 47 skips in the pond. In 2011 the pond contained 186 skips. Up to 01/04/2022, 139 skips have been removed and size reduced in WAMAC pending a decision on recycling or disposal at the LLWR, leaving a stock of 47.

Uncertainty factors on volumes:	Stock (upper):	x 1.0	Arisings (upper)	x
	Stock (lower):	x 1.0	Arisings (lower)	x

WASTE SOURCE Skips were/are used for the movement and storage of materials within the pond.

PHYSICAL CHARACTERISTICS

General description: Envelope dimensions of a skip are: 2,387mm x 1,880mm x 1,581mm (envelope volume of 7.08m³ is used); mass 1.25te. Skips are constructed from an open topped aluminium box held within a mild steel frame. Skips are large heavy items weighing 1.25t each. The waste has not undergone any change since it was generated.

Physical components (%vol): Skips, comprising Alclad (aluminium alloy) sheet (23.6% of material volume) and mild steel (76.4% of material volume).The mild steel is also coated with an aluminium protective layer.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 0.18

Comment on density: Density based on estimated skip weight divided by envelope volume of skip.

CHEMICAL COMPOSITION

General description and components (%wt): Mild steel (76%), aluminium alloy (Alclad) (24%).

Chemical state: Neutral

Chemical form of radionuclides: Th: None expected.

Metals and alloys (%wt): The waste comprises mainly mild steel framework. Aluminium alloy (Alclad) present as flat sheets fabricated into boxes and secured in the mild steel framework. Overall size 2,387x1,880x1,581 mm.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	~90.0	Unknown grade.	
Iron.....			
Aluminium.....	~10.0	Alclad' 0.007m ³ per skip.	
Beryllium.....	0		
Cobalt.....	0		
Copper.....			
Lead.....	0		

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Magnox/Magnesium.....	0
Nickel.....	
Titanium.....	0
Uranium.....	TR
Zinc.....	0
Zircaloy/Zirconium.....	0
Other metals.....	0

Organics (%wt): No organic materials are present. None present.

	(%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.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	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.....	0		
Sand.....	0		
Glass/Ceramics.....			
Graphite.....	0		
Desiccants/Catalysts.....	0		
Asbestos.....	0		
Non/low friable.....			

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Moderately friable.....

Highly friable.....

Free aqueous liquids..... 0

Free non-aqueous liquids..... 0

Powder/Ash..... 0

Inorganic anions (%wt): Inorganic anions are not expected to be present.

	(%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 No hazardous materials are present.
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.....	0	
Soluble solids as bulk chemical compounds.....	0	

Hazardous substances / -
non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....	0	
Chlorinated solvents.....		

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Formaldehyde.....	
Organometallics.....	
Phenol.....	0
Styrene.....	
Tri-butyl phosphate.....	0
Other organophosphates.....	
Vinyl chloride.....	0
Arsenic.....	0
Barium.....	
Boron.....	0
Boron (in Boral).....	
Boron (non-Boral).....	
Cadmium.....	0
Caesium.....	
Selenium.....	0
Chromium.....	0
Molybdenum.....	0
Thallium.....	
Tin.....	0
Vanadium.....	0
Mercury compounds.....	
Others.....	0
Electronic Electrical Equipment (EEE)	
EEE Type 1.....	
EEE Type 2.....	
EEE Type 3.....	
EEE Type 4.....	
EEE Type 5.....	

Complexing agents (%wt): No

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids.....	0	
Other organic complexants.....	0	No other complexing agents are present.
Total complexing agents.....	0	

Potential for the waste to contain discrete items: Yes. Waste itself may be a discrete item

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off site	Stream volume %
Low force compaction Supercompaction (HFC) Incineration Solidification Decontamination Metal treatment Size reduction Decay storage Recycling / reuse Other / various None	Off-site	100.0

Comment on planned treatments:

The skips have been deemed suitable for metal melting and exports are ongoing.

Many skips contain other wastes. They cannot be retrieved for disposal until emptied. In addition, some empty skips may be retained in the pond until all other wastes are removed to aid sorting/retrieval operations of other wastes.

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 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	100.0	

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

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: Up to 01/04/2022. 139 skips have been removed from the pond, and have been monitored and shown to be acceptable for recycling through metal melting. Any skips not meeting the CFA for metal melting will be subject to a Waste Enquiry Note to LLWR requesting alternate treatment method or LLWR disposal. LLW Slag produced during metal melting will be returned to LLWR for disposal. This will be consigned by the service provider in a HHISO alongside slags from other waste streams undergoing the same treatment.

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 from skip contents, pond water and sludges.
Uncertainty: -

Definition of total alpha and total beta/gamma: The estimated total activity is based on 20 gamma probe measurements on each skip exported to WAMAC which are averaged and converted to TBq/t using the Activity Conversion Factor (ACF) for the waste stream 2X117/1. The alpha assessment is based on the ratio of beta/gamma to alpha in the waste stream document (12.97:1). The fingerprint itself is derived from coupon samples taken from the Pond Skips in 2011.

Measurement of radioactivities: By gamma probe measurement on the 97 skips removed from the pond. The total activity on the skips exported thus far ranges from 1.1 to 11 GBq/te betagamma. For the purposes of this submission it has been rounded to an average of 6GBq/te beta gamma. Based on skip weight of 1.25te and volume of 7.08m³, this gives total beta activity of 1.06E-3TBq/m³. The alpha figure is calculated from the Activity Conversion Factor for this waste stream of 12.97:1 beta:alpha.

Other information: Short-lived daughters are not included.

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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	6.09E-06	BB 2			Gd 153				
Be 10					Ho 163				
C 14	1.02E-06	BB 2			Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55	3.08E-08	BB 2			Pb 210				
Co 60	1.00E-07	BB 2			Bi 208				
Ni 59					Bi 210m				
Ni 63	5.36E-06	BB 2			Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	3.57E-04	BB 2			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	8.48E-07	BB 2		
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238	5.93E-07	BB 2		
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	2.13E-06	BB 2		
Sn 123					Pu 239	2.00E-05	BB 2		
Sn 126					Pu 240	2.00E-05	BB 2		
Sb 125					Pu 241	5.47E-05	BB 2		
Sb 126					Pu 242				
Te 125m					Am 241	1.73E-05	BB 2		
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137	2.75E-04	BB 2			Cm 244	7.28E-08	BB 2		
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147	1.18E-07	BB 2			Cf 251				
Sm 147					Cf 252				
Sm 151	1.04E-05	BB 2			Other a				
Eu 152					Other b/g				
Eu 154	2.46E-07	BB 2			Total a	-6.09E-05	BB 2	0	
Eu 155					Total b/g	-7.11E-04	BB 2	0	

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