

WASTE STREAM	2S314	WAGR - HVVLLW
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SITE Windscale
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Sellafield Limited
WASTE TYPE VLLW
 Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	0 m ³
Future arisings -	1.4.2022 - 31.3.2023.....	0 m ³
	1.4.2023 - 31.3.2024.....	0 m ³
	1.4.2024 - 31.3.2025.....	0 m ³
	1.4.2025 - 31.3.2030.....	~0 m ³
	1.4.2030 - 31.3.2052.....	~6656.0 m ³
Total future arisings:		6656.0 m ³
Total waste volume:		6656.0 m ³

Comment on volumes: Includes HVVLLW component of bioshield, plus general HVVLLW from WAGR decommissioning.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.5
 Stock (lower): x Arisings (lower) x 0.5

WASTE SOURCE The waste is the HVVLLW components of the arisings from WAGR decommissioning.

PHYSICAL CHARACTERISTICS

General description: -
 Physical components (%vol): General HVVLLW from WAGR decommissioning (90% by volume) plus concrete from WAGR bioshield (10% by volume).
 Sealed sources: The waste does not contain sealed sources.
 Bulk density (t/m³): NE
 Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): -
 Chemical state: -
 Chemical form of radionuclides: -
 Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....			
Other ferrous metals.....			
Iron.....			
Aluminium.....			
Beryllium.....			
Cobalt.....			
Copper.....			
Lead.....			
Magnox/Magnesium.....			

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Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....			
Zircaloy/Zirconium.....			
Other metals.....	<80.0	All metals.	
Organics (%wt):	-		
	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....			
Paper, cotton.....			
Wood.....			
Halogenated plastics			
Total non-halogenated plastics.....			
Condensation polymers.....			
Others.....			
Organic ion exchange materials....			
Total rubber.....			
Halogenated rubber			
Non-halogenated rubber.....			
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	<10.0	All organics.	
Other materials (%wt):	-		
	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..			
Inorganic sludges and flocs.....			
Soil.....			
Brick/Stone/Rubble.....			
Cementitious material.....	>10.0		
Sand.....			
Glass/Ceramics.....			
Graphite.....			
Desiccants/Catalysts.....			
Asbestos.....			
Non/low friable.....			
Moderately friable.....			

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Highly friable.....
 Free aqueous liquids.....
 Free non-aqueous liquids.....
 Powder/Ash.....

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..... NE
 Low flash point liquids..... NE
 Explosive materials..... NE
 Phosphorus..... NE
 Hydrides..... NE
 Biological etc. materials..... NE
 Biodegradable materials..... NE
 Putrescible wastes..... NE
 Non-putrescible wastes..... NE
 Corrosive materials..... NE
 Pyrophoric materials..... NE
 Generating toxic gases..... NE
 Reacting with water..... NE
 Higher activity particles..... NE
 Soluble solids as bulk chemical compounds..... NE

Hazardous substances / non hazardous pollutants: -

(%wt) Type(s) and comment

Acrylamide.....
 Benzene..... NE
 Chlorinated solvents.....
 Formaldehyde.....

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

Complexing agents (%wt):

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

Potential for the waste to contain discrete items: Yes. Potential to contain tools, steel fabrications and cut concrete blocks.

TREATMENT, PACKAGING AND DISPOSAL

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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:

Possible buffer storage prior to reuse/recycling. Decontamination, segregation and size-reduction may be applied.

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	NE

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
Authorised landfill	Out of scope	NE	2028	Medium	This waste stream is not expected to be disposed at LLWR. The baseline route is assumed to be authorised landfill. There is potential for a significant proportion to be categorised as out of scope and this will be dependant upon the extent of contamination and demolition techniques deployed. No data available to estimate opportunity volumes

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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): The waste meets the LLWR's Waste Acceptance Criteria (WAC).
The waste does not have a current WCH.

Not intended for LLWR disposal. Will be disposed of to specified landfill.

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: -

Uncertainty: Activity of bioshield (10% by volume of total) expected to be ~ 4.74E-03 TBq/m3 beta/gamma.

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: -

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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	Gd 153				
Be 10					Ho 163				
C 14				6	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36				6	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54				6	Pb 205				
Fe 55				6	Pb 210				
Co 60				6	Bi 208				
Ni 59					Bi 210m				
Ni 63				6	Po 210				
Zn 65				5	Ra 223				
Se 79					Ra 225				6
Kr 81					Ra 226				
Kr 85				8	Ra 228				
Rb 87					Ac 227				
Sr 90				6	Th 227				
Zr 93					Th 228				6
Nb 91					Th 229				8
Nb 92					Th 230				6
Nb 93m					Th 232				6
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99				6	U 232				6
Ru 106				6	U 233				6
Pd 107					U 234				6
Ag 108m					U 235				6
Ag 110m				5	U 236				6
Cd 109					U 238				6
Cd 113m					Np 237				6
Sn 119m					Pu 236				
Sn 121m					Pu 238				6
Sn 123					Pu 239				6
Sn 126					Pu 240				6
Sb 125				6	Pu 241				6
Sb 126					Pu 242				6
Te 125m					Am 241				6
Te 127m					Am 242m				
I 129				6	Am 243				
Cs 134				6	Cm 242				6
Cs 135					Cm 243				5
Cs 137				6	Cm 244				6
Ba 133					Cm 245				6
La 137					Cm 246				6
La 138					Cm 248				
Ce 144				6	Cf 249				
Pm 145					Cf 250				
Pm 147				6	Cf 251				
Sm 147					Cf 252				
Sm 151				6	Other a				
Eu 152				5	Other b/g				5
Eu 154				6	Total a	0		NE	
Eu 155				6	Total b/g	0		NE	

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