

WASTE STREAM	5C315	Active Handling Facility Decommissioning LLW
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SITE Harwell
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 - 31.3.2027.....	420.0 m ³
Total future arisings:		420.0 m ³
Total waste volume:		420.0 m ³
Comment on volumes:	Volumes updated for 2016 RWI to reflect SMART Inventory Review	
Uncertainty factors on volumes:	Stock (upper): x	Arisings (upper) x 1.3
	Stock (lower): x	Arisings (lower) x 0.7

WASTE SOURCE Decommissioning of a PIE facility.

PHYSICAL CHARACTERISTICS

General description: The waste comprises materials which have been removed during the consolidation of intermediate level wastes, and various waste materials from the decommissioning of redundant plant. There are also secondary materials such as used PPE, swabs etc. associated with the management of these wastes.

Physical components (%vol): Metal, concrete and building rubble, cellulose, plastics and rubber.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 1.9

Comment on density: Density taken from WSCD. This density is for the waste following any treatments i.e. supercompaction.

CHEMICAL COMPOSITION

General description and components (%wt): Metal, concrete and building rubble, cellulose, plastics and rubber.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Activation product.
Ra: Source contamination and decay product.
Pu: Fuel contamination.

Metals and alloys (%wt): Bulky materials such as large metal containers generated during the consolidation of intermediate levels wastes are present.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	~20.0		
Iron.....			
Aluminium.....	NE		
Beryllium.....			
Cobalt.....			
Copper.....	NE		
Lead.....	~4.0		
Magnox/Magnesium.....	NE		
Nickel.....			

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Titanium.....

Uranium.....

Zinc..... NE

Zircaloy/Zirconium..... NE

Other metals..... NE No information is available on the breakdown of metal types.

Organics (%wt): Both plastics and rubbers will be present but it is not known whether they will be halogenated.

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

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	NE		
Soil.....	NE		
Brick/Stone/Rubble.....	~75.0		
Cementitious material.....	P		
Sand.....			
Glass/Ceramics.....	NE		
Graphite.....	NE		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			

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Highly friable.....	
Free aqueous liquids.....	0
Free non-aqueous liquids.....	0
Powder/Ash.....	0

Inorganic anions (%wt): Inorganic Anion content of waste is unknown.

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

Hazardous substances / non hazardous pollutants: None expected

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

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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.....
 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): No

(%wt) Type(s) and comment

EDTA.....
 DPTA.....
 NTA.....
 Polycarboxylic acids.....
 Other organic complexants.....
 Total complexing agents.....

Potential for the waste to contain discrete items: Not yet determined. Large Concrete Items (LCIs) may be DIs; drummed (ungROUTED)/"rubbleised" wastes assumed not DIs Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs

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		~36.0
Solidification		
Decontamination		
Metal treatment		~3.0
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		~61.0

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	61.0	1.9
Expected to be consigned to an On-Site Disposal Facility		
Expected to be consigned to an Incineration Facility	36.0	0.40
Expected to be consigned to a Metal Treatment Facility	3.0	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 05, 17 05 03*/04

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: Activity is from fuel contamination and fission products.

Uncertainty: Data is taken from a variety of sources and has been published in the WSCD.

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				8	Gd 153				8
Be 10				8	Ho 163				8
C 14				8	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36				8	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			5.25E-08	BB 2	Pb 205				8
Fe 55			3.18E-08	BB 2	Pb 210		2.88E-08	BB 2	8
Co 60			7.73E-06	BB 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			3.28E-08	BB 2	Po 210		2.57E-08	BB 2	8
Zn 65				8	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226		2.03E-07	BB 2	8
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90			4.25E-05	BB 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				8
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99				8	U 232				8
Ru 106			6.89E-09	BB 2	U 233				8
Pd 107				8	U 234				8
Ag 108m				8	U 235				8
Ag 110m				8	U 236				8
Cd 109				8	U 238				8
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238		3.58E-07	BB 2	8
Sn 123				8	Pu 239		1.36E-07	BB 2	8
Sn 126				8	Pu 240		2.03E-07	BB 2	8
Sb 125				8	Pu 241		1.1E-05	BB 2	8
Sb 126				8	Pu 242				8
Te 125m				8	Am 241		5.25E-07	BB 2	8
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134			1.39E-07	BB 2	Cm 242				8
Cs 135				8	Cm 243				8
Cs 137			5.68E-05	BB 2	Cm 244		1.31E-07	BB 2	8
Ba 133				8	Cm 245				8
La 137				8	Cm 246				8
La 138				8	Cm 248				8
Ce 144			3.72E-09	BB 2	Cf 249				8
Pm 145				8	Cf 250				8
Pm 147			1.64E-05	BB 2	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151				8	Other a				8
Eu 152				8	Other b/g				8
Eu 154			4.91E-07	BB 2	Total a	0	1.58E-06	BB 2	8
Eu 155			1.14E-06	BB 2	Total b/g	0	1.36E-04	BB 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