

WASTE STREAM	5C08	ILW Concrete Lined Drums
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SITE Harwell

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 152.1		
Future arisings:				
Total future arisings:		0.0		
Total waste volume:		152.1		

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: -

Additional information on quantities: -

Uncertainty factors on volumes: Stock (upper): x 1.05 Arisings (upper): x -
Stock (lower): x 0.95 Arisings (lower): x -

WASTE SOURCE Wastes from various sites which were packaged for the abandoned 1982 sea disposal campaigns.

PHYSICAL CHARACTERISTICS

General description: Miscellaneous radioactive wastes held in mild steel drums within a concrete carcass. Internal packages contain absorbed liquid, precipitated sludge, incinerator ash, and laboratory trash. Type 1801 sea disposal drums contain an internal drum of 100 litres in an external drum of 200 litres and weigh up to 352 kg. Type 1802 sea disposal drums contain an internal drum of 200 litres in an external drum of 450 litres and weigh up to 1060 kg (one drum is 5890 kg). Type 1803 sea disposal drums contain various inner drums from 10 litres to 200 litres in an external drum of 630 litres and weigh up to 2290 kg.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.8

Comment on density: Total mass divided by total volume.

CHEMICAL COMPOSITION

General description and components (%wt): The waste consists of metals, glass, plastics, paper, sludges, ash etc. in mild steel drums within a concrete carcass. Concrete/ cemented wastes (37%), ferrous metals (24%), Al (7%), other metals including sources (9%), plastics (4%), cellulose (2%), balance others.

Chemical state: Neutral

Sheet metal proportion / thickness: The thickness of the drum skins and cans within is ~3mm. The form of metals within the wastes varies. Uranium can be present as single items up to 50kg.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 8.0	Grades of stainless are generally unknown, and in many cases only "metal" is declared; taken to be mild steel. A proportion of the waste (~4%) consists of sources. The mass of these is assumed to be dominated by stainless. Other alloys may also be present, but none specifically declared.	
Other ferrous metals.....	~ 20.0	Ferrous metals consist principally of mild steel; small amounts of cast iron are also present.	
Iron.....	-	-	
Aluminium.....	~ 7.0	-	
Beryllium.....	TR	-	
Cobalt.....	-	-	
Copper.....	< 0.10	-	
Lead.....	< 4.0	-	
Magnox/Magnesium.....	TR	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	~ 0.70	-	
Zinc.....	TR	-	
Zircaloy/Zirconium.....	TR	-	
Other metals.....	~ 0.73	Other metals principally U & Th. Also small amounts of cobalt, cadmium, titanium, tungsten, and beryllium; traces of scandium, tantalum, iridioplatinum, palladium.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 2.1	-	
Paper, cotton.....	~ 2.0	-	
Wood.....	< 0.10	-	
Halogenated plastics.....	~ 2.0	Halogenated plastic is principally PVC, though PTFE may also be present.	
Total non-halogenated plastics.....	~ 2.0	-	
Condensation polymers.....	TR	-	
Others.....	~ 2.0	The non-halogenated plastic is principally polythene.	
Organic ion exchange materials.....	TR	-	
Total rubber.....	~ 0.10	-	
Halogenated rubber.....	~ 0.10	Rubbers are expected to comprise neoprene and hypalon.	
Non-halogenated rubber.....	TR	-	
Hydrocarbons.....	-	-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	TR	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	~ 0.10	-	
Inorganic sludges and flocs.....	< 7.0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	TR	-	
Cementitious material.....	= 45.4	-	
Sand.....	-	-	
Glass/Ceramics.....	~ 1.0	-	
Graphite.....	< 0.10	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	TR	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	TR	-	
Free non-aqueous liquids.....	TR	-	
Powder/Ash.....	P	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	TR	-
Low flash point liquids.....	TR	-
Explosive materials.....	= 0	-
Phosphorus.....	= 0	-
Hydrides.....	= 0	-
Biological etc. materials.....	= 0	-
Biodegradable materials.....	0	-
Putrescible wastes.....	= 0	-
Non-putrescible wastes.....	-	-
Corrosive materials.....	TR	-
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:

	(%wt)	Type(s) and comment
Acrylamide.....	0	-
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.....		-

Complexing agents (%wt):

Yes		
	(%wt)	Type(s) and comment
EDTA.....		-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....		-
		Trace oxalic acid in one drum. MoD monoliths contain cemented decontamination reagent (permanate with EDTA+ citrate) the precise composition of which is unknown. These drums represent <7% of the total stream mass, most of which will be cement.
Total complexing agents.....	TR	-

Physical components:

	Number	Type(s) and comment
Sources.....		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....		-
EEE Type 2.....		-
EEE Type 3.....		-
EEE Type 4.....		-
EEE Type 5.....		-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction Decay storage Low force compaction Supercompaction (HFC) Incineration Drying/dewatering/liquid separation Tie down/fixatives/strippable coating/painting application Decontamination Metal treatment Recycling / reuse Thermal treatment, including vitrification Encapsulation Polymer encapsulation Other physical treatment Other chemical treatment Containerisation Treatment not yet determined None		

Comments on planned treatments:

-

Conditioning method:

The CLDs will be overpacked into either TN Gemini or Full Height ISOs for transfer to Sellafield where they will receive final treatment in preparation for long term storage at GDF.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

Further information on the conditioning matrix:

Expected to use 3:1 PFA 0.42 w/s as developed for Harwell RHILW.

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
-	-	-	-	-	-

Range in container waste loading: -

Other information on packaging and conditioning:

-

Conditioned density (t/m³):

~ 1.8

Conditioned density comment:

The density will vary with the combination of drums within each package.

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)			
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

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

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: Predominantly contamination from fuel handling facilities. Also some activated items from MTR operations and sealed sources and bulk uranium from small users' facilities.

Uncertainty: Data was completely revised in RWI 2013 as a result of a thorough review of original information and application of waste fingerprints. The accuracy has, therefore, been improved but still depends upon the accuracy of the original declarations.

Measurement of radioactivities: Fingerprints have been applied to original consignors' declarations. These declarations were often based upon gamma measurements, with some neutron counting.

Chemical form of radionuclides: H-3: Some tritiated D2O is present, remainder from activation of metals
C-14: Small proportion as labelled organic compounds. Bulk as activation product.
Cl-36: From activation of impurities in metals
Se-79: -
Tc-99: -
I-129: From fission products
Ra: Some Ra and Ra/Be sources, remainder within fuel contamination.
Th: Bulk thorium metal and thorium oxide
U: Principally as bulk metal, with some as irradiated metal/ oxide fuel
Np: -
Pu: Probably principally as oxide or metal fuel

WASTE STREAM			5C08		ILW Concrete Lined Drums				
Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	1.17E-01	B B 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	2.54E-05	B B 2			Ho 166m		8		
Na 22	1.56E-08	B B 2			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	9.57E-05	B B 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	8.24E-08	B B 2		
Mn 54		8			Pb 205		8		
Fe 55	5.05E-08	B B 2			Pb 210	8.78E-05	B B 2		
Co 60	2.81E-06	B B 2			Bi 208		8		
Ni 59	9.60E-07	B B 2			Bi 210m		8		
Ni 63	7.37E-04	B B 2			Po 210	8.03E-05	B B 2		
Zn 65		8			Ra 223	1.28E-05	B B 2		
Se 79		8			Ra 225		8		
Kr 81		8			Ra 226	5.23E-04	B B 2		
Kr 85	2.78E-05	B B 2			Ra 228	1.38E-07	B B 2		
Rb 87		8			Ac 227	1.28E-05	B B 2		
Sr 90	1.78E-03	B B 2			Th 227	1.26E-05	B B 2		
Zr 93		8			Th 228	1.25E-07	B B 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230	4.14E-09	B B 2		
Nb 93m	2.56E-07	B B 2			Th 232	1.40E-07	B B 2		
Nb 94	1.09E-07	B B 2			Th 234	4.48E-06	B B 2		
Mo 93	1.91E-08	B B 2			Pa 231	1.62E-05	B B 2		
Tc 97		8			Pa 233	2.44E-05	B B 2		
Tc 99	4.27E-06	B B 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	7.51E-05	B B 2		
Ag 108m		8			U 235	4.47E-07	B B 2		
Ag 110m		8			U 236	4.62E-07	B B 2		
Cd 109		8			U 238	4.48E-06	B B 2		
Cd 113m		8			Np 237	2.44E-05	B B 2		
Sn 119m		8			Pu 236		8		
Sn 121m	2.24E-07	B B 2			Pu 238	1.29E-02	B B 2		
Sn 123		8			Pu 239	4.34E-02	B B 2		
Sn 126		8			Pu 240	2.96E-02	B B 2		
Sb 125	1.70E-09	B B 2			Pu 241	5.45E-01	B B 2		
Sb 126		8			Pu 242	1.72E-05	B B 2		
Te 125m		8			Am 241	1.01E-01	B B 2		
Te 127m		8			Am 242m	3.82E-06	B B 2		
I 129		8			Am 243	9.36E-06	B B 2		
Cs 134		8			Cm 242	3.15E-06	8		
Cs 135		8			Cm 243	1.51E-06	B B 2		
Cs 137	6.79E-02	B B 2			Cm 244	8.19E-05	B B 2		
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	3.50E-08	B B 2			Cf 251		8		
Sm 147		8			Cf 252	3.57E-09	B B 2		
Sm 151	4.92E-06	B B 2			Unsp a				
Eu 152	1.48E-08	B B 2			Unsp b/g				
Eu 154	2.09E-06	B B 2			Total a	1.88E-01	*	0	*
Eu 155	5.05E-08	B B 2			Total b/g	7.32E-01	*	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 the 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
* Total calculated from the 114 declared radionuclides