

WASTE STREAM	5C39	Solid Waste Complex Operational LLW
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SITE Harwell

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 110.7		
Future arisings:	1.4.2025 - 31.3.2028	401.4		
Total future arisings:		401.4		
Total waste volume:		512.1		

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

Comment on arising rates: Rates of arisings depend on operations carried out.

Additional information on quantities: 141m³ transferred to 5C55 (New Stream - Miscellaneous Legacy LLW) to aid clarity. Disposals during 2013-2016 of 233m³.

Uncertainty factors on volumes:

Stock (upper):	x 1.20	Arisings (upper):	x 1.20
Stock (lower):	x 0.80	Arisings (lower):	x 0.80

WASTE SOURCE Operational waste from the Solid Waste Plant and waste generated from housekeeping, maintenance and refurbishment work.

PHYSICAL CHARACTERISTICS

General description: The vast majority of the waste arisings are soft, low activity wastes which are suitable for incineration. Maintenance, housekeeping and refurbishment work generates the next highest volume of waste consisting of small amounts of concrete/rubble, WEEE (VLLW), unreclaimable low grade metals and equipment suitable for disposal as VLLW. ILW retrieval operations create a small amount of higher activity wastes, such as paper swabs and soft wastes from maintenance and routine operations that require disposal to LLWR.

Changes since waste generated: None.

Bulk density (t/m³): ~ 1.0

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Metal 20%, Concrete/rubble 24%, Soil 2%, biodegradables 19%, plastics 17%, rubber 15%, wood 2%, Others 1%;

Chemical state: Neutral

Sheet metal proportion / thickness: Sheet metal may be present in a range of thicknesses.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 4.0	Alloy - drums, tools, pipe, etc	
Other ferrous metals.....	~ 19.2	Alloy - Outer packagings (Drums), dismantled equipment and machinery parts, tools, containers, safety shoes (toe caps)	
Iron.....	TR	Solid, small, pieces of unreclaimable metal	
Aluminium.....	~ 0.01	Alloy - unreclaimable pieces, tools, ladder parts, small containers, signage	
Beryllium.....	-	-	
Cobalt.....	-	-	
Copper.....	TR	Solid, small, pieces of unreclaimable metal	
Lead.....	~ 0.02	Various solid metal, sheets, pipes, containers	
Magnox/Magnesium.....	NE	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	TR	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	= 1.0	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 2.0	-	
Paper, cotton.....	-	-	
Wood.....	~ 2.0	-	
Halogenated plastics.....	~ 11.0	Solid materials from decontamination ops, ex-pipework, furniture, PPE, PVC sheeting. Outer containers (Dolav type boxes)	
Total non-halogenated plastics.....	~ 10.0	-	
Condensation polymers.....	~ 0	-	
Others.....	~ 10.0	Solid materials from decontamination ops, trunking, cabling, sheeting, PPE	
Organic ion exchange materials.....	TR	-	
Total rubber.....	~ 19.0	-	
Halogenated rubber.....	~ 9.5	neoprene and hypalon	
Non-halogenated rubber.....	~ 9.5	-	
Hydrocarbons.....	~ 0.80	-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	~ 0.40	Solid pieces from building fabric or old flooring materials	
Asphalt/Tarmac (no coal tar).....	~ 0.20	Drums containing solid ex-building or flooring materials	
Bitumen.....	~ 0.20	Drums containing solid ex-flooring sealing materials	
Others.....	-	-	
Other organics.....	-	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	-	-	
Inorganic sludges and flocs.....	-	-	
Soil.....	~ 2.0	-	
Brick/Stone/Rubble.....	~ 30.0	-	
Cementitious material.....	-	-	
Sand.....	-	-	
Glass/Ceramics.....	-	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	0	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	~ 0	-	

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

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	TR	-
Low flash point liquids.....	= 0	-
Explosive materials.....	= 0	-
Phosphorus.....	= 0	-
Hydrides.....	= 0	-
Biological etc. materials.....	= 0	-
Biodegradable materials.....	~ 19.0	-
Putrescible wastes.....	~ 5.0	-
Non-putrescible wastes.....	~ 14.0	-
Corrosive materials.....	-	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	P	6m2
Higher activity particles.....	-	-
Soluble solids as bulk chemical compounds.....	-	-

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Boro

No

Total

11

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DISPOSAL

7

C.

17% of this stream is expected to be disposed of as VLLW to landfill.

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Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	1/2 Height WAMAC IP-2 ISO (TC08)	7.0	21.6	18.8	2	-
	1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	2.0	10.0	18.3	2	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): -

Conditioned density comment: -

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	= 9.0	1.0	
Expected to be consigned to a Landfill Facility	= 17.0	1.0	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 74.0	0.40	
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: 17 04 05, 17 05 03*, 17 05 04, 17 02 03

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: Contamination from range of waste management operations.

Uncertainty: Arisings content will vary with building operations.

Measurement of radioactivities: -

Chemical form of radionuclides:

- H-3: Unknown
- C-14: -
- Cl-36: -
- Se-79: -
- Tc-99: -
- I-129: -
- Ra: Unknown
- Th: Probably metal, oxide or nitrate.
- U: Probably metal, oxide or nitrate.
- Np: Unknown
- Pu: Probably metal, oxide or nitrate.

WASTE STREAM 5C39 Solid Waste Complex Operational LLW									
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	4.33E-07	C C 2	4.33E-07	C C 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	2.27E-09	C C 2	2.27E-09	C C 2	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36		8		8	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Ti 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	3.14E-08	C C 2	3.14E-08	C C 2	Pb 210	1.59E-07	C C 2	1.59E-07	C C 2
Co 60	1.34E-06	C C 2	1.34E-06	C C 2	Bi 208		8		8
Ni 59	1.27E-07	C C 2	1.27E-07	C C 2	Bi 210m		8		8
Ni 63	9.59E-06	C C 2	9.59E-06	C C 2	Po 210	1.59E-07	C C 2	1.59E-07	C C 2
Zn 65		8		8	Ra 223	1.01E-07	C C 2	1.01E-07	C C 2
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226	1.70E-07	C C 2	1.70E-07	C C 2
Kr 85	2.11E-07	C C 2	2.11E-07	C C 2	Ra 228	2.00E-08	C C 2	2.00E-08	C C 2
Rb 87		8		8	Ac 227	1.01E-07	C C 2	1.01E-07	C C 2
Sr 90	2.97E-05	C C 2	2.97E-05	C C 2	Th 227	9.91E-08	C C 2	9.91E-08	C C 2
Zr 93	1.73E-09	C C 2	1.73E-09	C C 2	Th 228	2.02E-08	C C 2	2.02E-08	C C 2
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230	1.33E-08	C C 2	1.33E-08	C C 2
Nb 93m	5.08E-09	C C 2	5.08E-09	C C 2	Th 232	2.00E-08	C C 2	2.00E-08	C C 2
Nb 94	6.80E-09	C C 2	6.80E-09	C C 2	Th 234	2.01E-08	C C 2	2.01E-08	C C 2
Mo 93	6.66E-09	C C 2	6.66E-09	C C 2	Pa 231	9.56E-08	C C 2	9.56E-08	C C 2
Tc 97		8		8	Pa 233	1.67E-09	C C 2	1.67E-09	C C 2
Tc 99	1.47E-09	C C 2	1.47E-09	C C 2	U 232	1.58E-09	C C 2	1.58E-09	C C 2
Ru 106		8		8	U 233	6.67E-09	C C 2	6.67E-09	C C 2
Pd 107		8		8	U 234	6.81E-09	C C 2	6.81E-09	C C 2
Ag 108m	1.74E-08	C C 2	1.74E-08	C C 2	U 235	6.67E-09	C C 2	6.67E-09	C C 2
Ag 110m		8		8	U 236	1.67E-09	C C 2	1.67E-09	C C 2
Cd 109		8		8	U 238	2.01E-08	C C 2	2.01E-08	C C 2
Cd 113m	1.48E-06	C C 2	1.48E-06	C C 2	Np 237	1.67E-09	C C 2	1.67E-09	C C 2
Sn 119m		8		8	Pu 236		8		8
Sn 121m	1.97E-07	C C 2	1.97E-07	C C 2	Pu 238	6.97E-07	C C 2	6.97E-07	C C 2
Sn 123		8		8	Pu 239	2.79E-07	C C 2	2.79E-07	C C 2
Sn 126		8		8	Pu 240	2.34E-07	C C 2	2.34E-07	C C 2
Sb 125	1.63E-09	C C 2	1.63E-09	C C 2	Pu 241	5.22E-06	C C 2	5.22E-06	C C 2
Sb 126		8		8	Pu 242	6.67E-09	C C 2	6.67E-09	C C 2
Te 125m		8		8	Am 241	8.71E-07	C C 2	8.71E-07	C C 2
Te 127m		8		8	Am 242m		8		8
I 129	6.67E-09	C C 2	6.67E-09	C C 2	Am 243		8		8
Cs 134		8		8	Cm 242		8		8
Cs 135		8		8	Cm 243	5.94E-09	C C 2	5.94E-09	C C 2
Cs 137	2.71E-05	C C 2	2.71E-05	C C 2	Cm 244	9.27E-08	C C 2	9.27E-08	C C 2
Ba 133		8		8	Cm 245	6.67E-09	C C 2	6.67E-09	C C 2
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147	2.39E-09	C C 2	2.39E-09	C C 2	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151	1.12E-07	C C 2	1.12E-07	C C 2	Unsp a				
Eu 152	5.78E-06	C C 2	5.78E-06	C C 2	Unsp b/g				
Eu 154	3.31E-06	C C 2	3.31E-06	C C 2	Total a	2.92E-06	*	2.92E-06	*
Eu 155	7.55E-08	C C 2	7.55E-08	C C 2	Total b/g	8.51E-05	*	8.51E-05	*

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