

WASTE STREAM	5C334	Replacement Effluent Treatment Plant LLW
--------------	-------	--

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	= 17.2		
Future arisings:	1.4.2025 - 31.3.2026	~ 7.8		
Total future arisings:		7.8		
Total waste volume:		25.0		

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

Comment on arising rates: Arisings result from decommissioning operations on the site.

Additional information on quantities: Volumes updated for 2016 RWI to reflect SMART Inventory Review

Uncertainty factors on volumes:

Stock (upper):	x 1.30	Arisings (upper):	x 1.30
Stock (lower):	x 0.70	Arisings (lower):	x 0.70

WASTE SOURCE Waste arising from the treatment of active effluent from site decommissioning. Waste will be processed through evaporators and encapsulated in Disposable Settling Tanks.

PHYSICAL CHARACTERISTICS

General description: Waste arising from the treatment of active effluent from site decommissioning. Waste will be processed through evaporators and encapsulated in Disposable Settling Tanks.

Changes since waste generated: Active effluent in Disposable Settling Tanks.

Bulk density (t/m³): ~ 2.0

Comment on density: Based on density of similar waste stream.

CHEMICAL COMPOSITION

General description and components (%wt): Active effluent

Chemical state: -

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	P	-	
Other ferrous metals.....	~ 30.0	-	
Iron.....		-	
Aluminium.....	P	-	
Beryllium.....		-	
Cobalt.....		-	
Copper.....	P	-	
Lead.....	P	-	
Magnox/Magnesium.....	TR	-	
Nickel.....		-	
Titanium.....		-	
Uranium.....		-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	TR	-	
Other metals.....	TR	Trace amounts of uranium metal may be present.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	10.0	-	
Paper, cotton.....	P	-	
Wood.....	~ 10.0	-	
Halogenated plastics.....	P	PVC and PTFE	
Total non-halogenated plastics.....	= 0	-	
Condensation polymers.....	= 0	-	
Others.....	= 0	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	P	-	
Halogenated rubber.....	P	hypalon and neoprene	
Non-halogenated rubber.....	P	-	
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.....	NE	-	
Inorganic sludges and flocs.....	NE	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	P	-	
Cementitious material.....	~ 55.0	-	
Sand.....	~ 5.0	-	
Glass/Ceramics.....	= 0	-	
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.....	= 0	-
Chloride.....	= 0	-
Iodide.....	= 0	-
Cyanide.....	= 0	-
Carbonate.....	P	-
Nitrate.....	= 0	-
Nitrite.....	= 0	-
Phosphate.....	= 0	-
Sulphate.....	= 0	-
Sulphide.....	= 0	-

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.....	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:

	(%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):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....		-
Total complexing agents.....		-

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		= 100.0

Comments on planned treatments:

-

Conditioning method:

-

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

Further information on the conditioning matrix:

-

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 IP-2 Disposal/Re-usable ISO (TC01/TC02)	100.0	10.0	18.3	3	-

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)	= 100.0	2.0	2025
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: Activity in waste has arisen from the treatment of liquid effluent.

Uncertainty: No data available for specific activities for the majority of the facility. Expected radionuclides listed above.

Measurement of radioactivities: The radionuclide fingerprint for this waste stream has been updated using data from waste stream 5C39.

Chemical form of radionuclides:

H-3: -
C-14: -
Cl-36: -
Se-79: -
Tc-99: -
I-129: -
Ra: Present as a decay product of fuel.
Th: -
U: Present as a metal or an oxide.
Np: -
Pu: Present as metal, oxide or nitrate

WASTE STREAM 5C334 Replacement Effluent Treatment Plant 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	2.75E-06	C C 2	2.75E-06	C C 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14		8		8	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		8		8	Pb 210	2.38E-09	C C 2	2.38E-09	C C 2
Co 60	1.01E-05	C C 2	1.01E-05	C C 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63		8		8	Po 210	2.18E-09	C C 2	2.18E-09	C C 2
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226	1.42E-08	C C 2	1.42E-08	C C 2
Kr 85		8		8	Ra 228	2.18E-07	C C 2	2.18E-07	C C 2
Rb 87		8		8	Ac 227		8		8
Sr 90	2.87E-05	C C 2	2.87E-05	C C 2	Th 227		8		8
Zr 93		8		8	Th 228	1.68E-07	C C 2	1.68E-07	C C 2
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232	3.29E-07	C C 2	3.29E-07	C C 2
Nb 94		8		8	Th 234	3.14E-07	C C 2	3.14E-07	C C 2
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106	2.08E-09	C C 2	2.08E-09	C C 2	U 233		8		8
Pd 107		8		8	U 234	9.71E-08	C C 2	9.71E-08	C C 2
Ag 108m		8		8	U 235	2.37E-08	C C 2	2.37E-08	C C 2
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238	3.14E-07	C C 2	3.14E-07	C C 2
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	5.40E-07	C C 2	5.40E-07	C C 2
Sn 123		8		8	Pu 239	3.29E-06	C C 2	3.29E-06	C C 2
Sn 126		8		8	Pu 240	3.00E-07	C C 2	3.00E-07	C C 2
Sb 125		8		8	Pu 241	3.55E-05	C C 2	3.55E-05	C C 2
Sb 126		8		8	Pu 242		8		8
Te 125m		8		8	Am 241	5.95E-06	C C 2	5.95E-06	C C 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	2.32E-08	C C 2	2.32E-08	C C 2	Cm 242		8		8
Cs 135		8		8	Cm 243		8		8
Cs 137	4.53E-05	C C 2	4.53E-05	C C 2	Cm 244	1.21E-07	C C 2	1.21E-07	C C 2
Ba 133		8		8	Cm 245		8		8
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		8		8	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Unsp a				
Eu 152		8		8	Unsp b/g				
Eu 154	8.01E-07	C C 2	8.01E-07	C C 2	Total a	1.12E-05	*	1.12E-05	*
Eu 155	2.29E-07	C C 2	2.29E-07	C C 2	Total b/g	1.24E-04	*	1.24E-04	*

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