

WASTE STREAM	9G105	Reactor LLW
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SITE Trawsfynydd

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	0		
Future arisings:	1.4.2025 - 31.3.2029	~ 249.1		
Total future arisings:		249.1		
Total waste volume:		249.1		

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

WASTE SOURCE This waste stream captures decommissioning activities and wastes arising in the Reactor Buildings.

PHYSICAL CHARACTERISTICS

General description: The waste consists of predominantly activated metals and concrete from decommissioned plant and structures and associated secondary wastes. Items include concrete blocks and cores ,drums, brickwork, rubble, doors, soft waste, PPE, a mild steel BROKK chassis with a total mass of 900kg has been size reduced to item weighing no more than 25kg , sheeting, pipework, girders, ducting, lead shielding and general deplanted equipment/components including valves, pumps, pipework ,cooling oil, 70 no of vacuum bags (close weave glass fibre bags weighing 115g when empty and averaging 8kg of dust from operational plant processing. Waste comprises decommissioned plant, structural materials and secondary wastes. Some organic liquid (oils) may be present.

Changes since waste generated: -

Bulk density (t/m³): = 1.2

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Metal (10%), concrete / rubble (76%), Biodegradable- non putrescibles (1%), plastics (7%), wood (2%), organics (1%), asbestos (~1%)

Chemical state: Neutral

Sheet metal proportion / thickness: Not assessed.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0.32	Deplanted equipment drum lining, sheeting, ducting, valves & pipework	
Other ferrous metals.....	= 9.1	Deplanted equipment drum lining, sheeting, valves & pipework	
Iron.....	-	-	
Aluminium.....	= 0.16	Deplanted equipment sheeting, ducting, valves and pipework	
Beryllium.....	-	-	
Cobalt.....	-	-	
Copper.....	-	-	
Lead.....	= 0.36	Shielding blocks, sheets & small amounts of lead from paint dust (77kg paint dust containing typically less than 0.8kg (1%) of lead)	
Magnox/Magnesium.....	-	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	-	-	
Zircaloy/Zirconium.....	-	-	
Other metals.....	NE	"Other" metals might be present in trace quantities.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	2.0	-	
Paper, cotton.....	-	-	
Wood.....	= 2.0	-	
Halogenated plastics.....	= 4.9	Pipework, valves, pumps, ducting and plastic sheeting	
Total non-halogenated plastics.....	= 1.6	-	
Condensation polymers.....	= 0	-	
Others.....	= 1.6	Soft Waste, Visqueen, takki rags, PPE, sample pots,	
Organic ion exchange materials.....	-	-	
Total rubber.....	1.0	-	
Halogenated rubber.....	~ 0.50	-	
Non-halogenated rubber.....	~ 0.50	-	
Hydrocarbons.....	-	-	
Oil or grease.....	~ 1.0	0.99% cooling oil and 0.05% white mineral oil	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	~ 1.0	-	

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.....	= 76.0	-	
Sand.....	-	-	
Glass/Ceramics.....	-	-	
Graphite.....	-	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	~ 0.90	-	
Non/low friable.....	~ 0.45	Asbestos contaminated material - Asbestos contaminated wastes from this wastestream are most commonly chrysotile from textured coatings and amosite from old pipework lagging and gasket seals. Crocidolite asbestos is known to be present in some of the wastes covered by this waste stream, namely deplanted insulation boards and lagging materials.	
Moderately friable.....	~ 0.45	Asbestos contaminated material - Asbestos contaminated wastes from this wastestream are most commonly chrysotile from textured coatings and amosite from old pipework lagging and gasket seals. Crocidolite asbestos is known to be present in some of the wastes covered by this waste stream, namely deplanted insulation boards and lagging materials.	
Highly friable.....	= 0	-	
Free aqueous liquids.....	-	-	
Free non-aqueous liquids.....	-	-	
Powder/Ash.....	= 0.52	0.42% concrete dust, 0.08% plaster dust, 0.02% magnesium oxide	

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

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	-	-
Low flash point liquids.....	-	-
Explosive materials.....	-	-
Phosphorus.....	-	-
Hydrides.....	-	-
Biological etc. materials.....	-	-
Biodegradable materials.....	1.0	-
Putrescible wastes.....	-	-
Non-putrescible wastes.....	= 1.0	-
Corrosive materials.....	-	-
Pyrophoric materials.....	-	-
Generating toxic gases.....	-	-
Reacting with water.....	P	20m2
Higher activity particles.....	-	-
Soluble solids as bulk chemical compounds.....	-	-

Hazardous substances / non hazardous pollutants:

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

Complexing agents (%wt):

Yes		
	(%wt)	Type(s) and comment
EDTA.....	-	-
DPTA.....	-	-
NTA.....	-	-
Polycarboxylic acids.....	-	-
Other organic complexants.....	= 0.05	Decon-90
Total complexing agents.....	= 0.05	-

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	On-site	= 0.3
Supercompaction (HFC)	Off-site	= 0.3
Incineration	Off-site	= 36.3
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	= 2.1
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		= 61.4

Comments on planned treatments:

55.97% of the stream is expected to be disposed of as VLLW to landfill.

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 WAMAC IP-2 ISO (TC08)	0.3	43.2	18.8	1	-
1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	5.4	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	5.7	1.2	
Expected to be consigned to a Landfill Facility	= 56.0	1.2	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 36.3	0.40	
Expected to be consigned to a Metal Treatment Facility	= 2.1	1.4	
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 04 07, 17 02 03, 17 06 01*

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: The major source of activity is activation products.

Uncertainty: The values quoted are derived from available measurements and are indicative of the activities to be expected.

Measurement of radioactivities: -

Chemical form of radionuclides: H-3: Most tritium is expected to be present as water but some may be in the form of other inorganic compounds or as organic compounds.
C-14: Chemical form of carbon 14 has not been determined but may be graphite.
Cl-36: The chemical form of chlorine 36 has not been determined.
Se-79: The selenium content is insignificant.
Tc-99: The technetium content is insignificant.
I-129: -
Ra: Radium isotope content is insignificant.
Th: The thorium content is insignificant.
U: Uranium isotope content is insignificant.
Np: The neptunium content is insignificant.
Pu: Chemical form of plutonium isotope has not been determined but may be plutonium oxides.

WASTE STREAM 9G105 Reactor 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			1.23E-05	C C 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			7.64E-06	C C 2	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			9.93E-08	C C 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	Ti 204				8
Mn 54				8	Pb 205				8
Fe 55			1.48E-07	C C 2	Pb 210				8
Co 60			6.59E-07	C C 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			2.30E-06	C C 2	Po 210				8
Zn 65				8	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226				8
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90			1.67E-08	C C 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			2.20E-09	C C 2	Th 234				8
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99				8	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234				8
Ag 108m			9.63E-09	C C 2	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				8
Sn 123				8	Pu 239				8
Sn 126				8	Pu 240				8
Sb 125				8	Pu 241			6.82E-09	C C 2
Sb 126				8	Pu 242				8
Te 125m				8	Am 241			2.24E-09	C C 2
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134				8	Cm 242				8
Cs 135				8	Cm 243				8
Cs 137			1.74E-08	C C 2	Cm 244				8
Ba 133			5.67E-09	C C 2	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				8	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151				8	Unsp a				
Eu 152			4.85E-09	C C 2	Unsp b/g				
Eu 154			9.87E-09	C C 2	Total a	0	*	2.24E-09	*
Eu 155				8	Total b/g	0	*	2.32E-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