

WASTE STREAM	9E45	Sludge
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SITE Oldbury

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	= 15.6		
Future arisings:				
Total future arisings:		0.0		
Total waste volume:		15.6		

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

Comment on arising rates: -

Additional information on quantities: No further arisings of this waste stream are expected.

Uncertainty factors on volumes:

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

WASTE SOURCE The sludge originated from routine filtration of liquid effluent and cooling pond water, special pond clean up operation liquors, active laundry liquors and reactor block active drain liquors.

PHYSICAL CHARACTERISTICS

General description: The waste consists of debris washed from persons, corrosion products such as magnesium hydroxide and carbonate detached from fuel elements and extraneous materials such as flakes of paint. Extraneous material particles may be up to several millimetres in size. Sludge particles may be up to millimetre size. There may generally be about 500 kg/m³ of dry matter but concentrations of large particles of extraneous material may result in the dry material being up to about 800 kg/m³. Once fluidised the sludge should be readily transferred by pumping but reconcentration may be time consuming. There are no large items that may require special handling.

Changes since waste generated: -

Bulk density (t/m³): = 1.2

Comment on density: The bulk density of the waste ranges from about 1.07 t/m³ to about 1.38 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Magnesium hydroxide, magnesium carbonate, water and a wide variety of other materials including some oil and grease.

Chemical state: Alkali

Sheet metal proportion / thickness: There are no metallic items present.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	TR	-	
Other ferrous metals.....	TR	-	
Iron.....		-	
Aluminium.....	= 1.7	-	
Beryllium.....	0	-	
Cobalt.....		-	
Copper.....	= 0.03	-	
Lead.....	= 0.02	-	
Magnox/Magnesium.....	TR	-	
Nickel.....		-	
Titanium.....		-	
Uranium.....		-	
Zinc.....	= 0.06	-	
Zircaloy/Zirconium.....	TR	-	
Other metals.....	TR	"Other" metals may be present at trace quantities.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	= 0	-	
Paper, cotton.....	= 0	-	
Wood.....	= 0	-	
Halogenated plastics.....	= 0	-	
Total non-halogenated plastics.....	= 0	-	
Condensation polymers.....	= 0	-	
Others.....	= 0	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	= 0	-	
Halogenated rubber.....	= 0	-	
Non-halogenated rubber.....	= 0	-	
Hydrocarbons.....	~ 10.0	-	
Oil or grease.....	~ 10.0	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	-	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	
Inorganic sludges and flocs.....	~ 90.0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	TR	-	
Sand.....	-	-	
Glass/Ceramics.....	= 0	-	
Graphite.....	TR	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	= 0	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	TR	-	
Powder/Ash.....	= 0	-	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	TR	-
Chloride.....	TR	-
Iodide.....	TR	-
Cyanide.....	= 0	-
Carbonate.....	= 0.80	-
Nitrate.....	TR	-
Nitrite.....	TR	-
Phosphate.....	TR	-
Sulphate.....	= 0.79	-
Sulphide.....	TR	-

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.....	TR	-
Biodegradable materials.....	0	-
Putrescible wastes.....	= 0	-
Non-putrescible wastes.....	-	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	TR	-
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.....	TR	-
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	On-site	100.0

Comments on planned treatments:

-

Conditioning method: Waste will be loaded using a fill/dry cycle to maximise waste loading volume. Waste will be transferred to a Type VI yellow box and dried.

Conditioning plants:

Plant Name	Location
OLD AVDS	Oldbury

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
	3 m³ RS box	100.0	7.8	2.5	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)	100.0		
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: Yes

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
GDF	LLWR	100.0	AMBER	Potential for disposal as LLW following encapsulation to meet LLWR WAC. Similar to recent experience at DNA with wet boundary wastes.

RADIOACTIVITY

Source: Sludge contains fission products, activation products and actinides resulting from filtration of effluents and liquors.

Uncertainty: Specific activity is a function of Station operating history. The activity values quoted are the specific activity of raw sludge. The values quoted were derived from measurements.

Measurement of radioactivities: The values quoted were derived from measurements.

Chemical form of radionuclides:

- H-3: Tritium is present, tritiated water.
- C-14: Carbon 14 is present, graphite dust particles.
- Cl-36: Chlorine 36 may be present in graphite dust particles.
- Se-79: The selenium content is insignificant.
- Tc-99: The technetium content is insignificant.
- I-129: -
- Ra: The radium isotope content is insignificant.
- Th: The thorium isotope content is insignificant.
- U: Uranium is present, probably as either natural uranium metal or oxides.
- Np: The neptunium content is insignificant.
- Pu: Plutonium isotopes are present. Trace amount from minor fuel leakage, probably metallic, or otherwise oxides.

WASTE STREAM			9E45		Sludge				
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	2.15E-04	C C 2			Gd 153		8		
Be 10					Ho 163		8		
C 14	6.99E-05	C C 2			Ho 166m		8		
Na 22					Tm 170		8		
Al 26	5.00E-07	C C 2			Tm 171		8		
Cl 36	2.00E-07	C C 2			Lu 174		8		
Ar 39					Lu 176		8		
Ar 42					Hf 178n		8		8
K 40					Hf 182		8		
Ca 41					Pt 193		8		
Mn 53					Tl 204		8		
Mn 54					Pb 205		8		
Fe 55	1.99E-07	C C 2			Pb 210		8		
Co 60	4.17E-06	C C 2			Bi 208		8		
Ni 59					Bi 210m		8		
Ni 63	8.10E-05	C C 2			Po 210		8		
Zn 65					Ra 223		8		
Se 79					Ra 225		8		
Kr 81					Ra 226		8		
Kr 85					Ra 228		8		
Rb 87					Ac 227		8		
Sr 90	1.39E-04	C C 2			Th 227		8		
Zr 93					Th 228		8		
Nb 91					Th 229		8		
Nb 92					Th 230		8		
Nb 93m					Th 232		8		
Nb 94					Th 234	5.00E-08	C C 2		
Mo 93					Pa 231		8		
Tc 97					Pa 233		8		
Tc 99					U 232		8		
Ru 106					U 233		8		
Pd 107					U 234	5.04E-08	C C 2		
Ag 108m	< 1.95E-06	C 3			U 235		8		
Ag 110m					U 236	< 4.00E-09	C 3		
Cd 109					U 238	5.00E-08	C C 2		
Cd 113m					Np 237		8		
Sn 119m					Pu 236		8		
Sn 121m					Pu 238	7.99E-06	C C 2		
Sn 123					Pu 239	7.00E-06	C C 2		
Sn 126					Pu 240	9.99E-06	C C 2		
Sb 125					Pu 241	1.46E-04	C C 2		
Sb 126					Pu 242		8		
Te 125m					Am 241	6.37E-05	C C 2		
Te 127m					Am 242m		8		
I 129					Am 243		8		
Cs 134	1.94E-09	C C 2			Cm 242		8		
Cs 135					Cm 243		8		
Cs 137	1.42E-02	C C 2			Cm 244	3.38E-07	C C 2		
Ba 133					Cm 245		8		
La 137					Cm 246		8		
La 138					Cm 248		8		
Ce 144					Cf 249		8		
Pm 145					Cf 250		8		
Pm 147	5.70E-09	C C 2			Cf 251		8		
Sm 147					Cf 252		8		
Sm 151	3.57E-06	C C 2			Unsp a				
Eu 152					Unsp b/g				
Eu 154	< 2.39E-07	C 3			Total a	8.92E-05	*	0	*
Eu 155					Total b/g	1.49E-02	*	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