

WASTE STREAM	2N17	Legacy Drums (Bulk)
--------------	------	---------------------

SITE LLW Repository

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Waste Services (NWS)

WASTE TYPE ILW

WASTE VOLUMES

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

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

Comment on arising rates: All waste generated.

Additional information on quantities: -

Uncertainty factors on volumes: Stock (upper): x 1.20 Arisings (upper): x -
Stock (lower): x 0.80 Arisings (lower): x -

WASTE SOURCE Historically, drums of waste from numerous sites were consigned to the LLWR for interim storage, prior to transfer to Sellafield Ltd for storage and/or processing. During a detailed provenance investigation carried out during the early stages of the project, sufficient evidence was identified to suggest that the Legacy Drum population arrived at the LLWR Site at some point during the 1960's. Subsequent investigations identified that the drums may also contain uranium fluoride-based wastes.

PHYSICAL CHARACTERISTICS

General description: There are 153 drums from an original inventory of 165, the other 12 of which will be transferred to Sellafield Limited and will be stored with their PCM, (Included as part of 2N03). Therefore, the waste stream covers the inventory of 153 drums only. The drums are 200 litre drums and contained various materials such as powders, sludges, plastics, cloths, soft bagged waste, unknown liquids, cloths and concrete (annulus).

Changes since waste generated: The drums were stripped down for sampling purposes, the outer drum was removed to reveal the concrete annulus of some of the drums. Other drums were subject to intrusive sampling with various tools and equipment.

Bulk density (t/m³): ~ 1.0

Comment on density: Bulk density is based on an estimate of the total waste mass divided by the total waste volume.

CHEMICAL COMPOSITION

General description and components (%wt): Metals (3%), Plastics (3%), Wood (4%), Concrete (60%), various types of powders found within the drums (30%).

Chemical state: Alkali

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 3.0	-	-
Other ferrous metals.....		Mild steel drums and misc. plant items/ tools.	
Iron.....		-	
Aluminium.....		-	
Beryllium.....		-	
Cobalt.....		-	
Copper.....		-	
Lead.....		-	
Magnox/Magnesium.....		-	
Nickel.....		-	
Titanium.....		-	
Uranium.....		-	
Zinc.....		-	
Zircaloy/Zirconium.....		-	
Other metals.....		-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 3.0	-	-
Paper, cotton.....	-	-	
Wood.....	~ 3.0	Wooden waste within drums	
Halogenated plastics.....	~ 4.0	-	
Total non-halogenated plastics.....		-	
Condensation polymers.....		-	
Others.....		-	
Organic ion exchange materials.....		-	
Total rubber.....	-	-	
Halogenated rubber.....		-	
Non-halogenated rubber.....		-	
Hydrocarbons.....	-	-	
Oil or grease.....		-	
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.....	~ 60.0	-	-
Inorganic sludges and flocs.....		-	
Soil.....		-	
Brick/Stone/Rubble.....		-	
Cementitious material.....		Enacapsulant material within the drums	
Sand.....		-	
Glass/Ceramics.....		-	
Graphite.....		-	
Desiccants/Catalysts.....		-	
Asbestos.....		-	
Non/low friable.....		-	
Moderately friable.....		-	
Highly friable.....		-	
Free aqueous liquids.....		-	
Free non-aqueous liquids.....		-	
Powder/Ash.....	~ 30.0	Various types of powders within the drums.	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	~ 10.0	Uranium fluorides (UF4, UF6 and UO2F2).
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.....	NE	-
Low flash point liquids.....	NE	-
Explosive materials.....	NE	-
Phosphorus.....	NE	-
Hydrides.....	NE	-
Biological etc. materials.....	NE	-
Biodegradable materials.....	NE	-
Putrescible wastes.....	NE	-
Non-putrescible wastes.....	NE	-
Corrosive materials.....	NE	-
Pyrophoric materials.....	NE	-
Generating toxic gases.....	NE	-
Reacting with water.....	NE	-
Higher activity particles.....	NE	-
Soluble solids as bulk chemical compounds.....	NE	-

Hazardous substances / non hazardous pollutants:

-

	(%wt)	Type(s) and comment
Acrylamide.....	NE	-
Benzene.....	NE	-
Chlorinated solvents.....	NE	-
Formaldehyde.....	NE	-
Organometallics.....	NE	-
Phenol.....	NE	-
Styrene.....	NE	-
Tri-butyl phosphate.....	NE	-
Other organophosphates.....	NE	-
Vinyl chloride.....	NE	-
Arsenic.....	NE	-
Barium.....	NE	-
Boron.....	NE	-
Boron (in Boral).....	NE	-
Boron (non-Boral).....	NE	-
Cadmium.....	NE	-
Caesium.....	NE	-
Selenium.....	NE	-
Chromium.....	NE	-
Molybdenum.....	NE	-
Thallium.....	NE	-
Tin.....	NE	-
Vanadium.....	NE	-
Mercury compounds.....	NE	-
Others.....	NE	-

Complexing agents (%wt):

Not yet determined

	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	-
Total complexing agents.....	NE	-

Physical components:

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

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		100.0
None		

Comments on planned treatments:

-

Conditioning method:

To be determined, not yet known.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

Unknown

Further information on the conditioning matrix:

To be determined - not yet known.

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
Not yet determined	100.0	-	-	-	-

Range in container waste loading: To be determined - not yet known.

Other information on packaging and conditioning:

To be determined - not yet known.

Conditioned density (t/m³):

NE

Conditioned density comment:

To be determined - not yet known.

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	100.0		

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

Opportunities for alternative disposal routing: Not yet determined

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

RADIOACTIVITY

Source:	The waste is a result of historic processes from external sites prior to transfer to the LLWR. It is believed that the drums originated from Westinghouse, Springfield and were generated by the conversion of uranium hexafluoride.
Uncertainty:	Specific activities have been based on the sampling results of each drum. Drums have been grouped based on their provenance and characteristics. Phys-chem analysis of the full population of drums has not been carried out.
Measurement of radioactivities:	An intrusive sampling campaign took place and samples were dispatched to a lab for full characterisation analysis.
Chemical form of radionuclides:	H-3: - C-14: - Cl-36: - Se-79: - Tc-99: Present I-129: - Ra: Present as metals, oxides or other forms. Th: Present as metals, oxides or other forms. U: Oxides, fluorides. Np: Present as metals, oxides or other forms. Pu: Nitrate, sulphide, fluoride or mixed oxides.

WASTE STREAM		2N17		Legacy Drums (Bulk)					
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	~ 4.34E-05	A A 1			Gd 153	~ 1.36E-05	A A 1		
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106	U 233								
Pd 107	U 234								
Ag 108m	U 235								
Ag 110m	U 236								
Cd 109	U 238								
Cd 113m	Np 237								
Sn 119m	Pu 236								
Sn 121m	Pu 238								
Sn 123	Pu 239								
Sn 126	Pu 240								
Sb 125	Pu 241								
Sb 126	Pu 242								
Te 125m	Am 241								
Te 127m	Am 242m								
I 129	Am 243								
Cs 134	Cm 242								
Cs 135	Cm 243								
Cs 137	Cm 244								
Ba 133	Cm 245								
La 137	Cm 246								
La 138	Cm 248								
Ce 144	Cf 249								
Pm 145	Cf 250								
Pm 147	Cf 251								
Sm 147	Cf 252								
Sm 151	Unsp a								
Eu 152	Unsp b/g								
Eu 154	Total a								
Eu 155	Total b/g								

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