

WASTE STREAM	9A916	Empty BPS Sludge Cans
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SITE Berkeley

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 = 0.7			
Future arisings:	1.4.2025 - 31.3.2026 2.5			
	1.4.2026 - 31.3.2027 12.0			
	1.4.2027 - 31.3.2028 12.0			
	1.4.2028 - 31.3.2029 12.0			
	1.4.2029 - 31.3.2038 56.1			
Total future arisings:	94.6			
Total waste volume:	95.3			

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

Comment on arising rates: -

Additional information on quantities: The waste occurs when sludge cans are emptied of their contents.

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 Mild steel sludge cans that will be emptied of sludge during Station decommissioning (see waste streams 9A71, 9A72, 9A77 and 9A78).

PHYSICAL CHARACTERISTICS

General description: The waste comprises Sludge Cans (305mm dia x 890mm height). The top of the can has a 3" filling penetration that is closed with a 3" BSP taper threaded plug. The containers are assumed to be emptied of their waste content prior to conditioning. The containers are thick walled (6.4mm thick base and 4.8mm thick walls) and are expected to be corroded to a lesser extent than the containers in 9A917. Some residual internal and external contamination is anticipated. There are no large items that may require special handling. Activity estimates indicate that it is LLW.

Changes since waste generated: -

Bulk density (t/m³): = 0.60

Comment on density: The density range is not estimated. The density estimate assumes that the empty sludge cans are stacked tightly together.

CHEMICAL COMPOSITION

General description and components (%wt): Empty mild steel sludge cans. Mild steel (>99%wt), residual sludge and other contamination (<1%wt).

Chemical state: Neutral

Sheet metal proportion / thickness: The sludge cans are of 305 mm diameter by 890 mm height with a 6.4 mm thick base and top and 4.8 mm thick walls.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	NE	-	
Other ferrous metals.....	> 99.0	-	
Iron.....		-	
Aluminium.....	= 0	-	
Beryllium.....	TR	-	
Cobalt.....		-	
Copper.....	= 0	-	
Lead.....	= 0	-	
Magnox/Magnesium.....	TR	-	
Nickel.....	TR	Nimonic	
Titanium.....		-	
Uranium.....		-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	TR	-	
Other metals.....	TR	No "other" metals have been identified but there may be trace quantities.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	TR	-	
Paper, cotton.....	TR	-	
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.....		-	
Oil or grease.....		-	
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.....	NE	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....		-	
Glass/Ceramics.....	= 0	-	
Graphite.....	NE	-	
Desiccants/Catalysts.....		-	
Asbestos.....	TR	-	
Non/low friable.....		-	
Moderately friable.....		-	
Highly friable.....		-	
Free aqueous liquids.....	NE	-	
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.....	< 1.0	-
Chloride.....	< 1.0	-
Iodide.....	< 1.0	-
Cyanide.....	= 0	-
Carbonate.....	< 1.0	-
Nitrate.....	< 1.0	-
Nitrite.....	< 1.0	-
Phosphate.....	< 1.0	-
Sulphate.....	< 1.0	-
Sulphide.....	< 1.0	-

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.....	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.....	TR	-

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	7.2	18.3	14	-

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			
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	0.60	

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: Empty steel sludge cans contaminated by fission products and activation products including actinides.

Uncertainty: Specific activity is a function of Station operating history. The values quoted were derived by extrapolation from available measurements and are indicative of the activities that might be expected. Washing of the waste prior to packaging should reduce the activity levels by at least an order of magnitude. This waste will possibly be LLW or even exempt at the time of disposal, depending on the processing method.

Measurement of radioactivities: The specific activity was assumed to be 0.1% of the average activity of the wastes now described by streams 9A71, 9A72, 9A77 and 9A78.

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 or organic compounds.
C-14: Carbon 14 will probably be present as graphite.
Cl-36: The chlorine 36 content is insignificant.
Se-79: -
Tc-99: -
I-129: -
Ra: -
Th: -
U: Chemical form of U isotopes has not been determined but may be oxides.
Np: -
Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

WASTE STREAM 9A916 Empty BPS Sludge Cans									
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	1.31E-07	C C 2	1.31E-07	C C 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	3.00E-09	C C 2	3.00E-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	< 3.00E-07	C 3	< 3.00E-07	C 3	Pt 193		8		8
Mn 53		8		8	Ti 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	< 2.20E-09	C 3	< 2.20E-09	C 3	Pb 210		8		8
Co 60	6.94E-08	C C 2	6.94E-08	C C 2	Bi 208		8		8
Ni 59	< 6.00E-09	C 3	< 6.00E-09	C 3	Bi 210m		8		8
Ni 63	6.31E-07	C C 2	6.31E-07	C C 2	Po 210		8		8
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	2.10E-05	C C 2	2.10E-05	C C 2	Th 227		8		8
Zr 93	1.00E-08	C C 2	1.00E-08	C C 2	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m	4.64E-09	C C 2	4.64E-09	C C 2	Th 232		8		8
Nb 94		8		8	Th 234	2.00E-09	C C 2	2.00E-09	C C 2
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233	6.00E-08	C C 2	6.00E-08	C C 2
Tc 99	5.00E-08	C C 2	5.00E-08	C C 2	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234	2.02E-09	C C 2	2.02E-09	C C 2
Ag 108m		8		8	U 235		8		8
Ag 110m		8		8	U 236	2.00E-09	C C 2	2.00E-09	C C 2
Cd 109		8		8	U 238	2.00E-09	C C 2	2.00E-09	C C 2
Cd 113m		8		8	Np 237	< 6.00E-08	C 3	< 6.00E-08	C 3
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	4.50E-07	C C 2	4.50E-07	C C 2
Sn 123		8		8	Pu 239	7.00E-07	C C 2	7.00E-07	C C 2
Sn 126	2.00E-09	C C 2	2.00E-09	C C 2	Pu 240	1.00E-06	C C 2	1.00E-06	C C 2
Sb 125		8		8	Pu 241	1.46E-05	C C 2	1.46E-05	C C 2
Sb 126		8		8	Pu 242	6.00E-09	C C 2	6.00E-09	C C 2
Te 125m		8		8	Am 241	4.43E-06	C C 2	4.43E-06	C C 2
Te 127m		8		8	Am 242m	4.65E-08	C C 2	4.65E-08	C C 2
I 129		8		8	Am 243	1.00E-08	C C 2	1.00E-08	C C 2
Cs 134		8		8	Cm 242	3.83E-08	C C 2	3.83E-08	C C 2
Cs 135	2.00E-09	C C 2	2.00E-09	C C 2	Cm 243		8		8
Cs 137	2.13E-04	C C 2	2.13E-04	C C 2	Cm 244	1.13E-08	C C 2	1.13E-08	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	1.71E-09	C C 2	1.71E-09	C C 2	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151	4.46E-07	C C 2	4.46E-07	C C 2	Unsp a				
Eu 152	1.39E-05	C C 2	1.39E-05	C C 2	Unsp b/g				
Eu 154	5.98E-08	C C 2	5.98E-08	C C 2	Total a	6.71E-06	*	6.71E-06	*
Eu 155	5.95E-09	C C 2	5.95E-09	C C 2	Total b/g	2.64E-04	*	2.64E-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