WASTE STREAM	9C17	Magnox Dissolution Plant Sludge

SITE Dungeness A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m^3)
Stocks: At 1.4.2025	= 29.0
Future arisings:	
Total future arisings:	**0.0**
Total waste volume:	**29.0**

OR

Conditioned (m^3)	Packaged (m^3)

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

WASTE SOURCE The sludge originates from routine filtration of dissolution plant effluents.

PHYSICAL CHARACTERISTICS

General description: Insoluble constituents of Magnox. There are no large items that may require special handling.

Changes since waste generated: -

Bulk density (t/m³): = 1.1

Comment on density: The bulk density of the waste ranges from 1.05 to 1.15 t/m³. The average is 1.1 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Insoluble residues from chemical dissolution of Magnox (including Fe, Co, Zn, Zr and Al). Siliceous materials including sand, some oil contamination and a range of other materials.

Chemical state: Alkali

Sheet metal proportion / thickness: No bulk or sheet metal items.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel……	NE	-	
Other ferrous metals……	NE	-	
Iron……		-	
Aluminium……	NE	-	
Beryllium……	TR	-	
Cobalt……		-	
Copper……	NE	-	
Lead……	TR	-	
Magnox/Magnesium……	< 1.0	-	
Nickel……		-	
Titanium……		-	
Uranium……		-	
Zinc……	NE	-	
Zircaloy/Zirconium……	NE	-	
Other metals……	NE	The "other" metal content has not been fully assessed.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	NE	-	
Paper, cotton	NE	-	
Wood	NE	-	
Halogenated plastics	= 0	-	
Total non-halogenated plastics	= 0	-	
Condensation polymers	= 0	-	
Others	= 0	-	
Organic ion exchange materials	TR	-	
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	~ 98.0	-	
Soil	= 0	-	
Brick/Stone/Rubble	= 0	-	
Cementitious material	= 0	-	
Sand		-	
Glass/Ceramics	= 0	-	
Graphite	NE	-	
Desiccants/Catalysts		-	
Asbestos	= 0	-	
Non/low friable		-	
Moderately friable		-	
Highly friable		-	
Free aqueous liquids	P	-	
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	NE	-
Chloride	NE	-
Iodide	NE	-
Cyanide	= 0	-
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	< 1.0	-
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	NE	-
Reacting with water	< 1.0	-
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		-
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		= 100.0
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments: Solidification to meet LLWR WAC in HHISO's.

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 (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	100.0	4.2	18.3	7	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m^3): -
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m^3	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	= 100.0	2.4	
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: Contaminated sludge. Contamination by fission products, actinides and activation products.

Uncertainty: -

Measurement of radioactivities: -

Chemical form of radionuclides:

H-3: Most tritium is expected to be present as water but some may be present in the form of other inorganic compounds or as organic compounds.
C-14: Carbon 14 may be present as graphite.
Cl-36: The chemical form of chlorine 36 may be inorganic chloride.
Se-79: -
Tc-99: -
I-129: -
Ra: -
Th: -
U: The chemical form of uranium isotopes has not been determined but will probably be uranium oxides.

Np: -
Pu: The chemical form of plutonium isotopes has not been determined but will probably be plutonium oxides.

WASTE STREAM **9C17** **Magnox Dissolution Plant Sludge**

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	1.39E-03	B B 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	4.09E-04	B B 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	2.32E-07	B B 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		8
K 40		8			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	1.54E-05	B B 2			Pb 210		8		
Co 60	1.55E-04	B B 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	3.86E-03	B B 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	5.19E-04	B B 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	4.07E-07	B B 2			Th 234	6.76E-05	B B 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	2.24E-06	B B 2			U 232		8		
Ru 106	8.09E-09	B B 2			U 233		8		
Pd 107		8			U 234	1.43E-06	B B 2		
Ag 108m	2.31E-05	B B 2			U 235	5.50E-07	B B 2		
Ag 110m		8			U 236	5.50E-07	B B 2		
Cd 109		8			U 238	6.76E-05	B B 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	6.30E-05	B B 2		
Sn 123		8			Pu 239	1.74E-04	B B 2		
Sn 126		8			Pu 240	1.74E-04	B B 2		
Sb 125	1.27E-07	B B 2			Pu 241	1.02E-03	B B 2		
Sb 126		8			Pu 242		8		
Te 125m	3.19E-08	B B 2			Am 241	3.13E-04	B B 2		
Te 127m		8			Am 242m		8		
I 129	1.84E-08	B B 2			Am 243		8		
Cs 134	3.21E-08	B B 2			Cm 242		8		
Cs 135		8			Cm 243	6.63E-07	B B 2		
Cs 137	1.46E-04	B B 2			Cm 244	5.79E-07	B B 2		
Ba 133	4.08E-06	B B 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	6.68E-07	B B 2			Unsp b/g				
Eu 154	5.42E-06	B B 2			**Total a**	**7.95E-04**	*	**0**	*
Eu 155	4.66E-07	B B 2			**Total b/g**	**7.61E-03**	*	**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