

WASTE STREAM**9D72****Sludge/resin from operational clean-up****SITE** Hinkley Point A**SITE OWNER** Nuclear Decommissioning Authority**WASTE CUSTODIAN** Magnox Limited**WASTE TYPE** ILW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

Reported

Stocks: At 1.4.2022..... 3.1 m³Future arisings - 1.4.2022 - 31.3.2025..... ~9.0 m³Total future arisings: 9.0 m³Total waste volume: 12.1 m³

Comment on volumes: Estimate of volumes of sludge and resin from clean up operations. The future arisings have the potential to be reclassified to LLW

Uncertainty factors on volumes: Stock (upper): x 1.3 Arisings (upper) x 1.2
Stock (lower): x 0.9 Arisings (lower) x 0.8**WASTE SOURCE** Residual wastes collected from clean out of plant.**PHYSICAL CHARACTERISTICS**

General description: Sludges and ion exchange materials.

Physical components (%vol): Dry resin (~43% wt), water (~57% wt) and some soluble organic material (<0.1% wt).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~0.68Comment on density: The bulk density of the waste is expected to range from about 0.7 to 1.2 t/m³.**CHEMICAL COMPOSITION**

General description and components (%wt): Sludges, ion exchange materials and water. The ion exchange material is Lewatit DN and is immersed in water. Negligible inorganic resin is present

Chemical state: -

Chemical form of radionuclides: H-3: The chemical form of tritium has not been determined but may be present as water or as other inorganic compounds or as organic compounds.

C-14: The chemical form of carbon 14 has not been determined.

Cl-36: The chemical form of chlorine 36 has not been determined.

Se-79: The selenium content is insignificant.

Tc-99: The chemical form of technetium has not been determined.

Ra: The radium isotope content is insignificant.

Th: The thorium isotope content is insignificant.

U: The chemical form of uranium isotopes has not been determined but may be uranium oxides.

Np: The chemical form of neptunium has not been determined.

Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): No bulk metal items present.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	NE		
Iron.....			
Aluminium.....	NE		
Beryllium.....	0		
Cobalt.....			

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Copper.....	0	
Lead.....	0	
Magnox/Magnesium.....	NE	
Nickel.....		
Titanium.....		
Uranium.....		
Zinc.....	0	
Zircaloy/Zirconium.....	0	
Other metals.....	0	No "other" metals present.

Organics (%wt): No halogenated plastics or rubbers present.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	0		
Paper, cotton.....	0		
Wood.....	0		
Halogenated plastics	0		
Total non-halogenated plastics.....	0		
Condensation polymers.....	0		
Others.....	0		
Organic ion exchange materials....	~43.0		
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.....	NE		

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	NE		
Inorganic sludges and flocs.....	NE		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	NE		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	TR		
Desiccants/Catalysts.....			

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Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	~57.0
Free non-aqueous liquids.....	0
Powder/Ash.....	0

Inorganic anions (%wt): -

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

Materials of interest for waste acceptance criteria: Magnox may be present, but is in such low concentrations so as not to pose a hazard.

	(%wt)	Type(s) and comment
Combustible metals.....	NE	
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.....	NE	
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

Hazardous substances / non hazardous pollutants: None expected.

	(%wt)	Type(s) and comment
Acrylamide.....		

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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.....
 Electronic Electrical Equipment (EEE)
 EEE Type 1.....
 EEE Type 2.....
 EEE Type 3.....
 EEE Type 4.....
 EEE Type 5.....

Complexing agents (%wt):

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

Potential for the waste to contain discrete items:

No. In & of itself not a DI; assumed not likely to contain any "rogue" items that could be.

PACKAGING AND CONDITIONING

Conditioning method: Conditioning method dependant on waste form; if sludge - immobilise with cement using the external mixer discharging into a 6m³ box HD. If resin - polymer encapsulation into 196-litre drum, grout 16 drums into 6m³ box HD.

Plant Name: -

Location: -

Plant startup date: -

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m³/y incoming waste): -

Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	6m ³ concrete box (HD)	100.0	2.41	5.8	5

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: Not specified

Other information: -

Conditioned density (t/m³): -

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
Disposal at a Geological Disposal Facility	Mixed Management Route	66.0	2023	Low	This waste could be disposed of to LLW disposal or treatment routes should it meet the WAC at time of disposal in order to divert from GDF

RADIOACTIVITY

Source: Spent ion exchange materials and contaminated sludges.

Uncertainty: Specific activity is a function of Station operating history. The values quoted are indicative of the activities that might be expected. Uncertainty bands remain unchanged from extant RWI as it is not deemed possible to provide justification for decreasing uncertainty based on the limited sampling carried out as part of the characterisation review.

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Definition of total alpha and total beta/gamma:

Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.

Measurement of radioactivities:

Values listed represent decay corrections (to reference date of 01/04/2022) of results listed in table 2 (reference date of 18/10/2017) of the characterisation review (PROG/HPA/WWF/0023) aside from results for U-235, U-236, Pu-239, Pu-240, Cm-243 and Cm-244. These are derived based on cited values for their nuclide pairs. The rationale for the relative proportions of U, Pu and Cm pairs used here to infer individual values given (20% U-235/80% U-236, 50% Pu-239/50% Pu-240 and 1.45% Cm-243/98.55% Cm-244) are described in section 5.5 of the characterisation report. Value for Th-234 is inferred from that for U-238 assuming these two nuclides are in secular equilibrium.

Other information:

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	1.52E-04	CC 2	1.52E-04	CC 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	9.31E-05	CC 2	9.31E-05	CC 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	<9.81E-06	C 3	<9.81E-06	C 3	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54	<3.65E-08	C 3	<3.65E-08	C 3	Pb 205		8		8
Fe 55	<1.28E-06	C 3	<1.28E-06	C 3	Pb 210		8		8
Co 60	3.99E-05	CC 2	3.99E-05	CC 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	1.42E-04	CC 2	1.42E-04	CC 2	Po 210		8		8
Zn 65	<3.03E-08	C 3	<3.03E-08	C 3	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	5.8E-03	CC 2	5.8E-03	CC 2	Th 227		8		8
Zr 93		8		8	Th 228	7.25E-08	8	7.25E-08	8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94	<1.18E-06	C 3	<1.18E-06	C 3	Th 234	1.54E-06	CC 2	1.54E-06	CC 2
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233	2.4E-05	8	2.4E-05	8
Tc 99	9.68E-05	CC 2	9.68E-05	CC 2	U 232	<1.08E-07	C 3	<1.08E-07	C 3
Ru 106	<1.16E-06	C 3	<1.16E-06	C 3	U 233		8		8
Pd 107		8		8	U 234	1.36E-06	CC 2	1.36E-06	CC 2
Ag 108m		8		8	U 235	4.1E-08	CC 2	4.1E-08	CC 2
Ag 110m		8		8	U 236	1.64E-07	CC 2	1.64E-07	CC 2
Cd 109		8		8	U 238	1.54E-06	CC 2	1.54E-06	CC 2
Cd 113m		8		8	Np 237	<2.4E-05	C 3	<2.4E-05	C 3
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	3.23E-04	CC 2	3.23E-04	CC 2
Sn 123		8		8	Pu 239	4.14E-04	CC 2	4.14E-04	CC 2
Sn 126		8		8	Pu 240	4.14E-04	CC 2	4.14E-04	CC 2
Sb 125	<6.25E-06	C 3	<6.25E-06	C 3	Pu 241	7.02E-03	CC 2	7.02E-03	CC 2
Sb 126		8		8	Pu 242		8		8
Te 125m	1.57E-06	8	1.57E-06	8	Am 241	2.16E-03	CC 2	2.16E-03	CC 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	1.55E-06	CC 2	1.55E-06	CC 2	Cm 242	<7.08E-09	C 3	<7.08E-09	C 3
Cs 135		8		8	Cm 243	3.13E-07	CC 2	3.13E-07	CC 2
Cs 137	8.89E-03	CC 2	8.89E-03	CC 2	Cm 244	1.99E-05	CC 2	1.99E-05	CC 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	<4.49E-07	C 3	<4.49E-07	C 3	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147	5.87E-06	CC 2	5.87E-06	CC 2	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151	1.69E-04	CC 2	1.69E-04	CC 2	Other a				
Eu 152		8		8	Other b/g				
Eu 154	5.92E-05	CC 2	5.92E-05	CC 2	Total a	3.36E-03	BC 2	3.36E-03	BC 2
Eu 155	9.08E-06	CC 2	9.08E-06	CC 2	Total b/g	2.25E-02	BC 2	2.25E-02	BC 2

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 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