

<b>WASTE STREAM</b>	<b>9D25/1</b>	<b>Ion Exchange Material</b>
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**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.....	36.5 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		36.5 m <sup>3</sup>

Comment on volumes: There will be no future arisings as the Sludge Tank containing this waste stream is full. The retrieval of ST1 (9D25) contents has now been completed. 44m<sup>3</sup> contained in 19 DCIC containers (interim storage prior to final conditioning), this includes 13.1m<sup>3</sup> of supernate, which will require additional suitable treatment prior to discharge. Proposed packaging solution is direct polymer encapsulation of solids into 196 litre drums, 16 drums per high density concrete box.

Uncertainty factors on volumes: Stock (upper): x 1.1 Arisings (upper) x  
Stock (lower): x 0.9 Arisings (lower) x

**WASTE SOURCE** Spent ion exchange materials arising from the treatment of pond waters.

**PHYSICAL CHARACTERISTICS**

General description: The ion exchange material is stored wet in DCIC Ministores. The ion exchange material flooded with water would be expected to have a voidage of about 0.3, i.e. about 0.3 of the volume of a bed of settled flooded ion exchange material would be interstitial water. There are no large items which may require special handling.

Physical components (%wt): Dry resin (35% wt) and water (65% wt).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~1.15

Comment on density: The bulk density of the waste is expected to range from about 1.1 to 1.2 t/m<sup>3</sup>.

**CHEMICAL COMPOSITION**

General description and components (%wt): Dry resin (~35% wt), water (~65% wt) and some soluble organic material (<0.1% wt). The ion exchange material is Lewatit DN and is immersed in water. Negligible inorganic resin is present.

Chemical state: Alkali

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.

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	<0.10		
Iron.....			
Aluminium.....	<0.10		
Beryllium.....	0		
Cobalt.....			
Copper.....	0		
Lead.....	0		
Magnox/Magnesium.....	0.20		
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....	0		
Zircaloy/Zirconium.....	0		
Other metals.....	0	No "other" metals present.	
Organics (%wt):		Proprietary ion exchange resin (Lewatit DN) and traces of soluble organic material are present. No halogenated plastics or rubbers present.	
	(%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....	~35.0	Lewatit DN	
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.....	0		

Other materials (%wt): -

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	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	NE		
Inorganic sludges and flocs.....	TR		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	TR		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	~65.0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

Inorganic anions (%wt):                      Concentrations in supernate similar to demineralised water except basic magnesium carbonate may be present where ion exchange beds operate without upstream filters.

	(%wt)	Type(s) and comment
Fluoride.....	0	
Chloride.....	0.01	
Iodide.....	0	
Cyanide.....	0	
Carbonate.....	0.30	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	NE	
Sulphate.....	0.05	
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.....	0.20	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	0	
Biodegradable materials.....	0	
Putrescible wastes.....	0	

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Non-putrescible wastes.....  
 Corrosive materials..... 0  
 Pyrophoric materials..... 0  
 Generating toxic gases..... 0  
 Reacting with water..... 0.20  
 Higher activity particles.....  
 Soluble solids as bulk chemical  
 compounds.....

Hazardous substances / No toxic metals expected.  
 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.....		
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

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Complexing agents (%wt):      No

(%wt)      Type(s) and comment

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants.....

Total complexing agents.....      0

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:      ST1 (9D25a&b) waste will be packaged separately from 9D26, 9D27, 9D28 & 9D29 as demonstration of compliance with limits will be different. Proposed packaging solution is direct polymer encapsulation of solids into 196 litre drums, 16 drums per high density concrete box. 9D25b represents the higher activity mules where additional work will be required to demonstrate compliance.

Plant Name:      -

Location:      Hinkley Point A Decommissioning Site

Plant startup date:      2023

Total capacity (m<sup>3</sup>/y incoming waste):      -

Target start date for packaging this stream:      2023

Throughput for this stream (m<sup>3</sup>/y incoming waste):      -

Other information:      -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	6m <sup>3</sup> concrete box (HD)	100.0	2.46	5.8	15

Likely container type comment:      -

Range in container waste volume:      -

Other information on containers:      -

Likely conditioning matrix:      -

Other information:      -

Conditioned density (t/m<sup>3</sup>):      -

Conditioned density comment:      -

Other information on conditioning:      -

Opportunities for alternative disposal routing:      -

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Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

**RADIOACTIVITY**

Source: Spent ion exchange resins arising from the treatment of pond water. Contamination by fission products, actinides and activation products.

Uncertainty: Specific activity is a function of Station operating history. The values quoted are indicative of the activities that might be expected.

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 were derived by extrapolating from available measurements.

Other information: -

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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	8.63E-06	CC 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	2.00E-06	CC 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	<3E-07	C 3			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		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	4.37E-09	CC 2			Pb 210		8		
Co 60	2.79E-07	CC 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	1.80E-05	CC 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	4.89E-01	CC 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	<2E-06	C 3			Th 234	<1E-06	C 3		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233	<9.66E-09	C 3		
Tc 99	<6E-06	C 3			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	9.15E-07	CC 2		
Ag 108m	<1.95E-06	C 3			U 235	1E-07	CC 2		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	1E-06	CC 2		
Cd 113m		8			Np 237	9.70E-09	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	3.56E-04	CC 2		
Sn 123		8			Pu 239	6.00E-04	CC 2		
Sn 126		8			Pu 240	7.00E-04	CC 2		
Sb 125		8			Pu 241	9.74E-03	CC 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	1.31E-03	CC 2		
Te 127m		8			Am 242m		8		
I 129	1E-07	CC 2			Am 243		8		
Cs 134	1.94E-07	CC 2			Cm 242		8		
Cs 135		8			Cm 243	4.95E-07	CC 2		
Cs 137	4.26E+00	CC 2			Cm 244	1.12E-05	CC 2		
Ba 133		8			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	1.70E-07	CC 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152	<1.39E-06	C 3			Other b/g				
Eu 154	1.50E-05	CC 2			<b>Total a</b>	<b>2.97E-03</b>	<b>CC 2</b>	<b>0</b>	
Eu 155	5.94E-07	CC 2			<b>Total b/g</b>	<b>4.76E+00</b>	<b>CC 2</b>	<b>0</b>	

**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