

<b>WASTE STREAM</b>	<b>9D26</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.....	15.0 m <sup>3</sup>

Total future arisings:		0 m <sup>3</sup>
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Total waste volume:		15.0 m <sup>3</sup>
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Comment on volumes: There will be no future arisings The bulk retrieval of ST2 (9D26) contents has now been completed. 18.69m<sup>3</sup> contained in 7 DCIC containers (interim storage prior to final conditioning), this includes 5.56m<sup>3</sup> of supernate, which will require additional suitable treatment prior to discharge. A small volume of resin, volume to be determined, remains in the heel of the tank.

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 (27% wt) and water (73% 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 (~27% wt), water (~73% wt) and some soluble organic material (0.2% 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 neptunium content is insignificant.  
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....	~27.0	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.....	~73.0		
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.....	0.04	
Sulphide.....	0	

Materials of interest for waste acceptance criteria:           Magnox is 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: This stream is to be co-packaged with 9D25, 9D27, 9D28 & 9D29 into concrete boxes.

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 (m³)	Payload (m³)	Number of packages
	6m³ concrete box (HD)	100.0	2.5	5.8	6

Likely container type comment: -  
 Range in container waste volume: -  
 Other information on containers: -  
 Likely conditioning matrix:  
 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
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**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:	-

**WASTE STREAM**

**9D26**

**Ion Exchange Material**

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	1.29E-05	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	<1E-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	1.97E-08	CC 2			Pb 210			8	
Co 60	6.95E-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	2.79E-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	<8.00E-07	C 3			Th 234	<4E-07	C 3		
Mo 93		8			Pa 231			8	
Tc 97		8			Pa 233			8	
Tc 99	<3E-06	C 3			U 232			8	
Ru 106		8			U 233			8	
Pd 107		8			U 234	5.09E-07	CC 2		
Ag 108m	<9.75E-07	C 3			U 235	1E-07	CC 2		
Ag 110m		8			U 236			8	
Cd 109		8			U 238	4E-07	CC 2		
Cd 113m		8			Np 237			8	
Sn 119m		8			Pu 236			8	
Sn 121m		8			Pu 238	1.77E-04	CC 2		
Sn 123		8			Pu 239	2E-04	CC 2		
Sn 126		8			Pu 240	2.00E-04	CC 2		
Sb 125	<1.14E-09	C 3			Pu 241	2.91E-03	CC 2		
Sb 126		8			Pu 242			8	
Te 125m		8			Am 241	3.95E-04	CC 2		
Te 127m		8			Am 242m			8	
I 129	<4E-08	C 3			Am 243			8	
Cs 134	6.48E-07	CC 2			Cm 242			8	
Cs 135		8			Cm 243	4.95E-07	CC 2		
Cs 137	1.41E+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	8.93E-06	CC 2			<b>Total a</b>	<b>9.85E-04</b>	<b>CC 2</b>		<b>0</b>
Eu 155	5.94E-07	CC 2			<b>Total b/g</b>	<b>1.69E+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