

WASTE STREAM	9D27	Ion Exchange Material
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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.....	27.0 m ³
Total future arisings:		0 m ³
Total waste volume:		27.0 m ³
Comment on volumes:	-	
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 under water in tanks. The dominant resin component comprised small dark beads consistent with Lewatit resin. The ion exchange material flooded with water would be expected to have a voidage of about 0.3, i.e. about a third of the bed volume of a settled flooded ion exchange material would be interstitial water. Due to the breakdown of IX material, there is a high probability of the activity being transferred into the interstitial water. There are no large items which may require special handling.

Physical components (%wt): Water (~66% wt), Dry Resin (~33% wt) and other organics (less than 1% wt).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1.15

Comment on density: The bulk density of the waste is expected to range from about 1.1 to 1.2 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Dry resin (~33% wt), water (~66% wt) and other organic content at <1% dry weight. The ion exchange material consists of Lewatit DN (~68% vol), Duolite (~29% vol) and IRN 105 (~3%vol).

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.
Tc-99: The chemical form of technetium has not been determined.
Ra: The radium isotope content is insignificant.
U: The chemical form of uranium isotopes has not been determined but may be uranium oxides.
Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

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

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

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Copper.....	0
Lead.....	0
Magnox/Magnesium.....	0.20
Nickel.....	
Titanium.....	
Uranium.....	
Zinc.....	0
Zircaloy/Zirconium.....	0
Other metals.....	0

Organics (%wt): Proprietary ion exchange resin (mainly Lewatit DN with some Duolite and IRN105) 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....	~33.0	Lewatit DN (~68% vol), Duolite (~29% vol) and IRN 105 (~3%vol)	
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): Traces of graphite may be present.

	(%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.....	0		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	TR		

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Desiccants/Catalysts.....	
Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	~66.0
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.....	<0.10	
Iodide.....	0	
Cyanide.....	0	
Carbonate.....	<0.10	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	<0.10	
Sulphate.....	~0.40	
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	
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.....		

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Hazardous substances /
non hazardous pollutants: None expected

	(%wt)	
Acrylamide.....		Type(s) and comment
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): No

	(%wt)	
EDTA.....		Type(s) and comment
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....		
Total complexing agents.....	0	

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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, 9D26, 9D28 & 9D29. At time of disposal, 16 drums are to be packaged into each HD Concrete Box.

Plant Name:

-

Location:

Hinkley Point A Site

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	2.46	5.8	11

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
-	-	-	-	-	-

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'.

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Measurement of
radioactivities:

The values quoted were derived by extrapolation from available measurements except Tc99 and I129 which were estimated using FISPIN calculation.

Other information:

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WASTE STREAM 9D27 Ion Exchange Material

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	5.21E-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	2E-07	CC 2			Tm 171		8		
Cl 36	<9E-06	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	1E-08	CC 2			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	4.47E-08	CC 2			Pb 210		8		
Co 60	1.28E-07	CC 2			Bi 208		8		
Ni 59	1E-08	CC 2			Bi 210m		8		
Ni 63	1.69E-04	CC 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	1E-06	CC 2			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	4.5E-02	CC 2			Th 227		8		
Zr 93	8E-06	CC 2			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	5.39E-06	CC 2			Th 232		8		
Nb 94	2E-09	CC 2			Th 234	<1E-07	C 3		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233	3.15E-08	CC 2		
Tc 99	<4E-04	C 3			U 232		8		
Ru 106		8			U 233		8		
Pd 107	4E-07	CC 2			U 234	1.07E-07	CC 2		
Ag 108m		8			U 235	3E-09	CC 2		
Ag 110m		8			U 236	2.01E-08	CC 2		
Cd 109		8			U 238	1E-07	CC 2		
Cd 113m	1.20E-06	CC 2			Np 237	3.15E-08	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m	4.40E-02	CC 2			Pu 238	8.28E-05	CC 2		
Sn 123		8			Pu 239	9.00E-05	CC 2		
Sn 126	2E-06	CC 2			Pu 240	9.99E-05	CC 2		
Sb 125	<4.74E-09	C 3			Pu 241	2.21E-03	CC 2		
Sb 126	2.8E-07	CC 2			Pu 242	5E-08	CC 2		
Te 125m	<1.19E-09	C 3			Am 241	2.53E-04	CC 2		
Te 127m		8			Am 242m	2.68E-07	CC 2		
I 129	<8E-07	C 3			Am 243	9.99E-08	CC 2		
Cs 134	2.21E-05	CC 2			Cm 242	2.21E-07	CC 2		
Cs 135	1E-05	CC 2			Cm 243	2.87E-08	CC 2		
Cs 137	1.72E+00	CC 2			Cm 244	3.98E-07	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	1.41E-07	CC 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	3.32E-06	CC 2			Other a				
Eu 152	<2.62E-07	C 3			Other b/g				
Eu 154	2.89E-06	CC 2			Total a	5.26E-04	CC 2	0	
Eu 155	1.98E-07	CC 2			Total b/g	1.81E+00	CC 2	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 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