

WASTE STREAM	9D29	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.....	29.2 m ³
Future arisings -	1.4.2022 - 31.3.2023.....	~0.8 m ³
Total future arisings:		0.8 m ³
Total waste volume:		30.0 m ³

Comment on volumes: 5m³ of this waste has been loaded into 2 DCIC mules, stored in the buffer store. Stocks and Arisings exceed Storage capacity, alternative storage arrangements will be required when waste is generated.

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

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 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. Tank capacity is 26.2m³. The additional volume has been transferred to DCIC's.

Physical components (%wt): Dry resin (36%), water (63%) and other organics ~1%.

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 (~36% wt), water (~63% wt) and other organic material (~1% wt). The ion exchange material in the stock volume consists of Lewatit DN, Duolite and IRA 93 all 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.
 Tc-99: The chemical form of technetium has not been determined.
 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 sheet or bulk metal items present.

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

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Cobalt.....	
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 (Lewatit DN), Duolite and traces of soluble organic material are 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	No halogenated plastics or rubbers present.	
Condensation polymers.....	0		
Others.....	0		
Organic ion exchange materials....	36.0	Lewatit DN, Duolite and IRA 93	
Total rubber.....	0		
Halogenated rubber	0	No halogenated plastics or rubbers present.	
Non-halogenated rubber.....	0		
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar).....			
Bitumen.....			
Others.....			
Other organics.....	0.10		

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.....	TR		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	0		

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Graphite.....	TR
Desiccants/Catalysts.....	
Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	~63.0
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.....	NE	
Carbonate.....	<0.10	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	NE	
Sulphate.....	<0.20	
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	
Non-putrescible wastes.....		
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
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 9D25a, 9D26, 9D27 & 9D28. At the time of disposal, it is assumed 50 drums do not meet transport criteria and are therefore packaged into TRU-Shields (accounted for in 9D25b). However this will be dependant on the activity of each drum.

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	2.5	5.8	12

Likely container type comment: -
 Range in container waste volume: -
 Other information on containers: The volume of the resin tank is 26.2m³ and when full the contents will be stored in mules for final packaging into containers dependant on activity.
 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.

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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:

The values quoted were derived by extrapolation from available measurements.

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	6.97E-06	CC 2	6.97E-06	CC 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	1.82E-04	CC 2	1.82E-04	CC 2	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26	1.99E-07	CC 2	1.99E-07	CC 2	Tm 171		8		8
Cl 36	<6.2E-08	C 3	<6.2E-08	C 3	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41	1.76E-08	CC 2	1.76E-08	CC 2	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54	<5.51E-07	C 3	<5.51E-07	C 3	Pb 205		8		8
Fe 55	6.08E-06	CC 2	6.08E-06	CC 2	Pb 210		8		8
Co 60	4.82E-06	CC 2	4.82E-06	CC 2	Bi 208		8		8
Ni 59	1.68E-08	CC 2	1.68E-08	CC 2	Bi 210m		8		8
Ni 63	1.65E-04	CC 2	1.65E-04	CC 2	Po 210		8		8
Zn 65	5.18E-09	CC 2	5.18E-09	CC 2	Ra 223		8		8
Se 79	2.07E-07	CC 2	2.07E-07	CC 2	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	1.08E-01	CC 2	1.08E-01	CC 2	Th 227		8		8
Zr 93	7.96E-06	CC 2	7.96E-06	CC 2	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m	3.93E-06	CC 2	3.93E-06	CC 2	Th 232		8		8
Nb 94	3.53E-09	CC 2	3.53E-09	CC 2	Th 234	<1.24E-07	C 3	<1.24E-07	C 3
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233	<3.57E-08	C 3	<3.57E-08	C 3
Tc 99	<1.06E-06	C 3	<1.06E-06	C 3	U 232		8		8
Ru 106	<4.91E-06	C 3	<4.91E-06	C 3	U 233		8		8
Pd 107	4.44E-07	CC 2	4.44E-07	CC 2	U 234	1.27E-07	CC 2	1.27E-07	CC 2
Ag 108m		8		8	U 235	1.13E-08	CC 2	1.13E-08	CC 2
Ag 110m	2.99E-08	CC 2	2.99E-08	CC 2	U 236	2.68E-08	CC 2	2.68E-08	CC 2
Cd 109		8		8	U 238	1.24E-07	CC 2	1.24E-07	CC 2
Cd 113m	2.68E-06	CC 2	2.68E-06	CC 2	Np 237	3.57E-08	CC 2	3.57E-08	CC 2
Sn 119m		8		8	Pu 236		8		8
Sn 121m	6.63E-02	CC 2	6.63E-02	CC 2	Pu 238	8.03E-05	CC 2	8.03E-05	CC 2
Sn 123		8		8	Pu 239	7.96E-05	CC 2	7.96E-05	CC 2
Sn 126	1.53E-06	CC 2	1.53E-06	CC 2	Pu 240	1.06E-04	CC 2	1.06E-04	CC 2
Sb 125	<1.23E-06	C 3	<1.23E-06	C 3	Pu 241	3.22E-03	CC 2	3.22E-03	CC 2
Sb 126	2.14E-07	CC 2	2.14E-07	CC 2	Pu 242	5.29E-08	CC 2	5.29E-08	CC 2
Te 125m	<3.08E-07	C 3	<3.08E-07	C 3	Am 241	1.4E-04	CC 2	1.4E-04	CC 2
Te 127m		8		8	Am 242m	3.3E-07	CC 2	3.3E-07	CC 2
I 129	<9.37E-07	C 3	<9.37E-07	C 3	Am 243	1.41E-07	CC 2	1.41E-07	CC 2
Cs 134	3.46E-03	CC 2	3.46E-03	CC 2	Cm 242	2.72E-07	CC 2	2.72E-07	CC 2
Cs 135	1.06E-05	CC 2	1.06E-05	CC 2	Cm 243	1.92E-07	CC 2	1.92E-07	CC 2
Cs 137	3.03E+00	CC 2	3.03E+00	CC 2	Cm 244	3.67E-06	CC 2	3.67E-06	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	<1.34E-05	C 3	<1.34E-05	C 3	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147	1.04E-04	CC 2	1.04E-04	CC 2	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151	4.66E-04	CC 2	4.66E-04	CC 2	Other a				
Eu 152	<1.29E-06	D 3	<1.29E-06	D 3	Other b/g				
Eu 154	3.03E-05	CC 2	3.03E-05	CC 2	Total a	4.11E-04	CC 2	4.11E-04	CD 2
Eu 155	8.73E-06	CC 2	8.73E-06	CC 2	Total b/g	3.21E+00	CC 2	3.21E+00	CD 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