

WASTE STREAM	9D26	Ion Exchange Material
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SITE Hinkley Point A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	15.0 m ³
Total future arisings:		0 m ³
Total waste volume:		15.0 m ³

Comment on volumes: There will be no future arisings as the Sludge Tank containing this waste stream is full. The bulk retrieval of ST2 (9D26) contents has now been completed. 18.69m³ contained in 7 DCIC containers (interim storage prior to final conditioning), this includes 5.56m³ 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: -

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 (~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.	
Stainless steel.....	0
Other ferrous metals.....	<0.10
Iron.....	
Aluminium.....	<0.10
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	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.		
	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):	-		
	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.....		

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	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.	
	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.	
	Combustible metals.....	0.20
	Low flash point liquids.....	0
	Explosive materials.....	0
	Phosphorus.....	0
	Hydrides.....	0
	Biological etc. materials.....	0
	Biodegradable materials.....	
	Putrescible wastes.....	0
	Non-putrescible wastes.....	
	Corrosive materials.....	0
	Pyrophoric materials.....	0
	Generating toxic gases.....	0
	Reacting with water.....	0.20
	Active particles.....	
	Soluble solids as bulk chemical compounds.....	
Hazardous substances / non hazardous pollutants:	No toxic metals expected.	
	Acrylamide.....	
	Benzene.....	
	Chlorinated solvents.....	
	Formaldehyde.....	
	Organometallics.....	
	Phenol.....	
	Styrene.....	
	Tri-butyl phosphate.....	

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Other organophosphates.....

Vinyl chloride.....

Arsenic.....

Barium.....

Boron.....

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

 EDTA.....

 DPTA.....

 NTA.....

 Polycarboxylic acids.....

 Other organic complexants.....

 Total complexing agents..... 0

PACKAGING AND CONDITIONING

Conditioning method: This stream is to be co-packaged with 9D25, 9D27, 9D28 & 9D29. 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 9D25), however this will be dependent on the activity of each drum. Other packages are assigned to 9D27.

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: -

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Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages

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:

Treatment	Stream volume (%)	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 ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	1.53E-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	4.21E-08	CC 2			Pb 210		8		
Co 60	1.03E-06	CC 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	1.84E-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	3.00E-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	5.08E-07	CC 2		
Ag 108m	<9.80E-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	1.82E-04	CC 2		
Sn 123		8			Pu 239	2E-04	CC 2		
Sn 126		8			Pu 240	2.00E-04	CC 2		
Sb 125	<2.41E-09	C 3			Pu 241	3.37E-03	CC 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	3.82E-04	CC 2		
Te 127m		8			Am 242m		8		
I 129	<4E-08	C 3			Am 243		8		
Cs 134	1.78E-06	CC 2			Cm 242		8		
Cs 135		8			Cm 243	5.31E-07	CC 2		
Cs 137	1.51E+00	CC 2			Cm 244	1.26E-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	3.75E-07	CC 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152	<1.62E-06	C 3			Other b/g				
Eu 154	1.14E-05	CC 2			Total a	9.77E-04	CC 2	0	
Eu 155	9.12E-07	CC 2			Total b/g	1.82E+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