

WASTE STREAM	9C36	Ion Exchange Resin from Ponds
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SITE Dungeness A
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Magnox Limited
WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	32.1 m ³
Total future arisings:		0 m ³
Total waste volume:		32.1 m ³
Comment on volumes:	There is a possibility of an extra 220 litres in this waste stream from CRU2, CRU3 & By-pass CRU.	
Uncertainty factors on volumes:	Stock (upper): x 1.2	Arisings (upper) x
	Stock (lower): x 0.8	Arisings (lower) x

WASTE SOURCE Pond water treatment plant caesium removal units.

PHYSICAL CHARACTERISTICS

General description: Spent ion exchange material arising from the treatment of pond waters. Material is stored under water in a tank. It should be easily pumped and have rapid settling characteristics. The ion exchange material flooded with water would be expected to have a voidage of 0.26 to 0.33, i.e. 0.26 to 0.33 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 (%vol): Ion exchange material (70% vol), interstitial water (30% vol). Other minor components are not assessed.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 1.21

Comment on density: The bulk density of the waste flooded with water will probably be about 1.21 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Proprietary organic ion exchange material- Duolite (phenol formaldehyde) and water, in which the ion exchange material is immersed.

Chemical state: -

Chemical form of radionuclides:
H-3: The chemical form of tritium has not been determined.
C-14: The chemical form of carbon 14 has not been determined but may be graphite.
Cl-36: The chemical form of chlorine 36 has not been determined but may be chloride.
Se-79: The chemical form of selenium has not been determined.
Tc-99: The chemical form of technetium has not been determined.
U: The chemical form of uranium isotopes is not determined but may be uranium oxides.
Np: The chemical form of neptunium has not been determined.
Pu: The chemical form of plutonium isotopes is not determined but may be plutonium oxides.

Metals and alloys (%wt): There are no sheet or bulk metal items.

Stainless steel.....	NE	
Other ferrous metals.....	NE	
Iron.....		
Aluminium.....	NE	
Beryllium.....	TR	
Cobalt.....		
Copper.....	NE	
Lead.....	TR	Lead would be in trace quantities, if present.
Magnox/Magnesium.....	NE	

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	Nickel.....		
	Titanium.....		
	Uranium.....		
	Zinc.....	NE	
	Zircaloy/Zirconium.....	NE	
	Other metals.....	NE	"Other" metals have not been assessed.
Organics (%wt):	Ion exchange resins: Duolite (phenol formaldehyde). There are 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....	~70.0	Duolite (phenol formaldehyde).
	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.....	NE	
Other materials (%wt):	-		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs.....	NE	
	Soil.....	0	
	Brick/Stone/Rubble.....	0	
	Cementitious material.....	0	
	Sand.....		
	Glass/Ceramics.....	0	
	Graphite.....	0	
	Desiccants/Catalysts.....		
	Asbestos.....	0	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	~30.0	
	Free non-aqueous liquids.....	0	

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	Powder/Ash.....	0
Inorganic anions (%wt):	Not fully assessed.	
	Fluoride.....	NE
	Chloride.....	NE
	Iodide.....	NE
	Cyanide.....	0
	Carbonate.....	NE
	Nitrate.....	NE
	Nitrite.....	NE
	Phosphate.....	NE
	Sulphate.....	NE
	Sulphide.....	NE
Materials of interest for waste acceptance criteria:	No materials likely to pose a fire or other non-radiological hazard have been identified.	
	Combustible metals.....	0
	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
	Active particles.....	
	Soluble solids as bulk chemical compounds.....	
Hazardous substances / non hazardous pollutants:	-	
	Acrylamide.....	
	Benzene.....	
	Chlorinated solvents.....	
	Formaldehyde.....	
	Organometallics.....	
	Phenol.....	
	Styrene.....	
	Tri-butyl phosphate.....	
	Other organophosphates.....	
	Vinyl chloride.....	
	Arsenic.....	

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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): Yes
 EDTA.....
 DPTA.....
 NTA.....
 Polycarboxylic acids.....
 Other organic complexants.....
 Total complexing agents..... TR

PACKAGING AND CONDITIONING

Conditioning method: -
 Plant Name: AVDS
 Location: Dungeness A Site
 Plant startup date: 2018
 Total capacity (m³/y incoming waste): -
 Target start date for packaging this stream: 2018
 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
	500 l RS drum (0mm Pb)	100.0	0.434	0.49	74

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Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: None

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. Resins are used to remove caesium from fuel pond water. There will be contamination by other fission products, actinides and activation products.

Uncertainty: -

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: -

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	1.79E-05	BB 1			Gd 153		8		
Be 10		8			Ho 163	1.01E-08	BB 2		
C 14	1.34E-06	BB 1			Ho 166m	3.1E-06	BB 2		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171	5.17E-07	BB 2		
Cl 36	2.39E-09	BB 1			Lu 174	8.45E-09	BB 2		
Ar 39	4.19E-07	BB 2			Lu 176		8		
Ar 42		8			Hf 178n	6.95E-06	BB 2		
K 40		8			Hf 182		8		
Ca 41	1.05E-08	BB 2			Pt 193	5.23E-08	BB 2		
Mn 53		8			Tl 204	9.24E-06	BB 2		
Mn 54		8			Pb 205		8		
Fe 55	5.99E-06	BB 1			Pb 210		8		
Co 60	7.2E-05	BB 2			Bi 208		8		
Ni 59	3.6E-07	BB 2			Bi 210m		8		
Ni 63	5.69E-04	BB 1			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	1.04E-08	BB 2			Ra 225		8		
Kr 81	1.02E-09	BB 2			Ra 226		8		
Kr 85	9.14E-04	BB 2			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	4.53E-02	BB 1			Th 227		8		
Zr 93	5.11E-07	BB 2			Th 228	1.67E-09	BB 1		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	1.69E-06	BB 2			Th 232		8		
Nb 94	1.21E-07	BB 2			Th 234	7.53E-07	BB 2		
Mo 93	7.14E-09	BB 2			Pa 231		8		
Tc 97		8			Pa 233	3E-08	BB 2		
Tc 99	4.16E-06	BB 1			U 232	1.63E-09	BB 2		
Ru 106	4.45E-07	BB 2			U 233	3E-09	BB 2		
Pd 107	2.54E-08	BB 2			U 234	5.37E-07	BB 1		
Ag 108m	5.01E-08	BB 2			U 235	1.95E-08	BB 1		
Ag 110m		8			U 236	7.18E-08	BB 1		
Cd 109		8			U 238	7.53E-07	BB 1		
Cd 113m	2.51E-06	BB 2			Np 237	3E-08	BB 2		
Sn 119m		8			Pu 236		8		
Sn 121m	5.42E-06	BB 2			Pu 238	9.17E-05	BB 1		
Sn 123		8			Pu 239	7.38E-05	BB 1		
Sn 126	9.44E-08	BB 2			Pu 240	7.33E-05	BB 1		
Sb 125	3.43E-05	BB 2			Pu 241	4.01E-03	BB 1		
Sb 126	1.32E-08	BB 2			Pu 242	1.3E-07	BB 2		
Te 125m	8.58E-06	BB 2			Am 241	1.82E-04	BB 1		
Te 127m		8			Am 242m	8.59E-07	BB 2		
I 129	8.8E-09	BB 1			Am 243	2.44E-07	BB 2		
Cs 134	5.07E-05	BB 2			Cm 242	7.09E-07	BB 1		
Cs 135	1.9E-07	BB 2			Cm 243	1.59E-07	BB 1		
Cs 137	1.11E+00	BB 1			Cm 244	2.73E-06	BB 1		
Ba 133	2.55E-07	BB 2			Cm 245		8		
La 137		8			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144	2.95E-08	BB 2			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	1.61E-05	BB 1			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	1.21E-04	BB 1			Other a				
Eu 152	3.09E-07	BB 2			Other b/g				
Eu 154	1.46E-04	BB 2			Total a	4.26E-04	BB 2	0	
Eu 155	4.45E-05	BB 2			Total b/g	1.16E+00	BB 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