

WASTE STREAM**9J03/C****Conditioned Ion Exchange Resin / sludge****SITE**

Hunterston A

SITE OWNER

Nuclear Decommissioning Authority

WASTE CUSTODIAN

Magnox Limited

WASTE TYPE

ILW

WASTE VOLUMES

		Conditioned	Packaged
Stocks:	At 1.4.2019.....	156.2 m ³	185.3 m ³
Total future arisings:		0 m ³	0 m ³
Total waste volume:		156.2 m ³	185.3 m ³
Number of waste packages in stock:	At 1.4.2019.....	71 package(s)	
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

Pond water treatment plant.

PHYSICAL CHARACTERISTICS

General description:	The waste consists of conditioned ion exchange resin types Lewatit DN (in a granular form) and IRN-74 and sludge.		
Physical components (%wt):	Resin (11%), Sludge (68%), Grout (21%).		
Sealed sources:	-		
Bulk density (t/m ³):	~1.8		
Comment on density:	The conditioned density range is approximately 1.6 to 1.9 t/m ³ .		

CHEMICAL COMPOSITION

General description and components (%wt):	Resin (11%) consisting of Lewatit DN - phenolsulphonic acid - formaldehyde condensate, strong cation resin (82%) and IRN-74 - methylene sulphonic acid (18%). Sludge (68%) and grout (21%).		
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 or 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 chemical form of selenium has not been determined. 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 present as 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 present as plutonium oxides.		
Metals and alloys (%wt):	There is no sheet metal.		
	Stainless steel.....	0	
	Other ferrous metals.....	TR	
	Iron.....		
	Aluminium.....	TR	
	Beryllium.....	0	
	Cobalt.....		
	Copper.....	TR	
	Lead.....	0	

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Magnox/Magnesium.....	TR
Nickel.....	
Titanium.....	
Uranium.....	
Zinc.....	TR
Zircaloy/Zirconium.....	0
Other metals.....	TR

Possibly trace amounts of nickel, molybdenum, sodium, calcium and potassium.

Organics (%wt):

The only organic materials in the waste are ion exchange resins, Lewatit DN - phenolsulphonic acid - formaldehyde condensate, strong cation resin (82% wt) and IRN-74 - methylene sulphonic acid (18% wt). Some water might be bound with the resins. There are no halogenated plastics or rubbers present in the waste.

Total cellulosics.....	0
Paper, cotton.....	0
Wood.....	0
Halogenated plastics	0
Total non-halogenated plastics.....	0
Condensation polymers.....	0
Others.....	0
Organic ion exchange materials....	11.0

Lewatit DN - phenolsulphonic acid - formaldehyde condensate, strong cation resin (82%) and IRN-74 - methylene sulphonic acid (18%).

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.	0
Inorganic sludges and flocs.....	68.0
Soil.....	0
Brick/Stone/Rubble.....	0
Cementitious material.....	21.0
Sand.....	
Glass/Ceramics.....	0
Graphite.....	0
Desiccants/Catalysts.....	

Grout

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Asbestos..... 0

Non/low friable.....

Moderately friable.....

Highly friable.....

Free aqueous liquids..... P

Free non-aqueous liquids..... 0

Powder/Ash..... 0

Inorganic anions (%wt):

The waste is expected to contain only trace quantities of inorganic ions (<100 ppm).

Fluoride..... TR

Chloride..... ~0.01

Iodide..... 0

Cyanide..... 0

Carbonate..... 0

Nitrate..... TR

Nitrite..... TR

Phosphate..... 0

Sulphate..... TR

Sulphide..... 0

Materials of interest for waste acceptance criteria:

The waste contains no hazardous materials.

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:

None expected.

Acrylamide.....

Benzene.....

Chlorinated solvents.....

Formaldehyde.....

Organometallics.....

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Phenol.....
 Styrene.....
 Tri-butyl phosphate.....
 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

Container type:	Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
	3m³ drum	100.0	2.2	2.2	71

Container type comment: -

Range in container waste volume: No significant variability is expected.

Other information on containers: The container material is stainless steel.

Conditioned density (t/m³): ~1.8

Conditioned density comment: The conditioned density range is approximately 1.6 to 1.9 t/m3.

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Other information on conditioning:

Wet ILW recovery and encapsulation plant used to conditioned Waste.

RADIOACTIVITY

Source:

The waste arises from the removal of caesium isotopes from cooling 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:

Activities have been taken from CALC 1064 issue 2 and decayed to 01/04/2019.

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	7.84E-04	CC 1			Gd 153		8		
Be 10	1.3E-07	CC 2			Ho 163	2.28E-07	CC 2		
C 14	1.09E-04	CC 1			Ho 166m	7.02E-05	CC 2		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171	2.74E-09	CC 2		
Cl 36	9.58E-07	CC 1			Lu 174	3.56E-09	CC 2		
Ar 39	7.24E-05	CC 2			Lu 176		8		
Ar 42	1.17E-09	CC 2			Hf 178n	7.37E-05	CC 2		
K 40		8			Hf 182		8		
Ca 41	1.7E-05	CC 1			Pt 193	4.94E-05	CC 2		
Mn 53		8			Tl 204	9.52E-06	CC 2		
Mn 54		8			Pb 205		8		
Fe 55	1.61E-04	CC 1			Pb 210		8		
Co 60	3.49E-04	CC 1			Bi 208		8		
Ni 59	3.43E-06	CC 1			Bi 210m		8		
Ni 63	5.29E-04	CC 1			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	2.82E-07	CC 2			Ra 225		8		
Kr 81	1.09E-06	CC 2			Ra 226		8		
Kr 85	4.61E-03	CC 2			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	8.36E-02	CC 1			Th 227		8		
Zr 93	1.25E-05	CC 2			Th 228	1.08E-07	CC 2		
Nb 91	3.11E-09	CC 2			Th 229		8		
Nb 92		8			Th 230	3.51E-09	CC 2		
Nb 93m	3.94E-05	CC 2			Th 232		8		
Nb 94	6.96E-06	CC 2			Th 234	1.03E-05	CC 2		
Mo 93	2.16E-07	CC 2			Pa 231		8		
Tc 97		8			Pa 233	1.08E-06	CC 2		
Tc 99	1.29E-04	CC 1			U 232	1.05E-07	CC 2		
Ru 106		8			U 233	1.61E-07	CC 2		
Pd 107	8.77E-07	CC 2			U 234	8.77E-06	CC 1		
Ag 108m	3.96E-06	CC 2			U 235	3.43E-07	CC 1		
Ag 110m		8			U 236	1.27E-06	CC 2		
Cd 109		8			U 238	1.03E-05	CC 1		
Cd 113m	2.55E-05	CC 2			Np 237	1.08E-06	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m	1.24E-04	CC 2			Pu 238	5.37E-03	CC 1		
Sn 123		8			Pu 239	5.46E-03	CC 1		
Sn 126	2.99E-06	CC 2			Pu 240	5.41E-03	CC 1		
Sb 125	2.71E-06	CC 2			Pu 241	1.1E-01	CC 1		
Sb 126	4.19E-07	CC 2			Pu 242	9.39E-06	CC 2		
Te 125m	6.78E-07	CC 2			Am 241	2.46E-02	CC 1		
Te 127m		8			Am 242m	2.87E-05	CC 2		
I 129	2.97E-06	CC 1			Am 243	3.5E-05	CC 2		
Cs 134	1.14E-06	CC 1			Cm 242	2.37E-05	CC 1		
Cs 135	6.58E-06	CC 2			Cm 243	3.39E-05	CC 1		
Cs 137	1.01E+00	CC 1			Cm 244	4.05E-04	CC 1		
Ba 133	9.53E-06	CC 2			Cm 245	5.13E-08	CC 2		
La 137	1.29E-08	CC 2			Cm 246	6.37E-09	CC 2		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145	1.97E-07	CC 2			Cf 250		8		
Pm 147	1.62E-04	CC 1			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	9.32E-03	CC 1			Other a				
Eu 152	8.76E-07	CC 2			Other b/g				
Eu 154	7.13E-04	CC 1			Total a	4.14E-02	CC 2	0	
Eu 155	1.49E-04	CC 1			Total b/g	1.22E+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