WASTE STREAM 9E961/C Ion Siv Unit Cartridges & Pre Filters

SITE Oldbury

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

WASTE VOLUMES

		Conditioned	Packaged
Stocks:	At 1.4.2019.....	0.8 m³	5.3 m³
Total future arisings:		0 m³	0 m³
Total waste volume:		0.8 m³	5.3 m³
Number of waste packages in stock:	At 1.4.2019.....	4 package(s)	

Comment on volumes: The volume of each cartridge/filter is 0.053 m3. There are 3 x cartridges and 1 x pre filter per MOSAIK (Total of 12 cartridges and 4 x pre filters).

Uncertainty factors on volumes:

Stock (upper):	x 1.1	Arisings (upper)	x
Stock (lower):	x 0.9	Arisings (lower)	x

WASTE SOURCE Ion Siv cartridges and pre filters used to remove caesium from pond water.

PHYSICAL CHARACTERISTICS

General description: Spent IONSIV cartridges and pre filters that formed part of the submersible caesium removal unit. Each cartridge will contain about 10 kg of water, less than 10% of this is expected to be free water, the rest is absorbed into the resin beads. There are a

Physical components (%wt): Spent IONSIV Cartridges and pre filters (100%). The waste is spent IONSIV cartridges, which are composed principally of a stainless steel hollow cylinder containing IONSIV material. There are also some pre-filters.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1.2

Comment on density: The density of 1.2 t/m3 assumes that each cartridge will contain 10 kg of water, giving a total mass of 66.2 kg for each cartridge.

CHEMICAL COMPOSITION

General description and components (%wt): IONSIV ion exchange material (~53%), stainless steel (~32%), water (~15%) and EPDM seal material (<1%). (EPDM is ethylene diene terpolymer). IonSiv is a crystalline silicotitanate.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Any tritium is likely to be present as water.
Cl-36: The chlorine 36 content is insignificant.
Pu: The chemical form of plutonium isotopes may be plutonium oxides.

Metals and alloys (%wt): The stainless steel forms a hollow cylinder with dimensions: internal diameter 122mm, external diameter 296mm and height 640mm.

Stainless steel.....	~32.0	The stainless steel is SS316L; nickel and chromium will be major constituents of the stainless steel cartridge housing.
Other ferrous metals.....	NE	
Iron.....		
Aluminium.....	NE	
Beryllium.....	TR	
Cobalt.....		
Copper.....	NE	
Lead.....	NE	
Magnox/Magnesium.....	NE	

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	Nickel		
	Titanium		
	Uranium	NE	
	Zinc	NE	
	Zircaloy/Zirconium	NE	
	Other metals	NE	Only the stainless steel content of the waste has been assessed.
Organics (%wt):	EPDM seal material (<1%wt) is present in the waste. Halogenated plastics and rubbers are not expected 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	0	
	Total rubber	<1.0	
	Halogenated rubber	0	
	Non-halogenated rubber	<1.0	EPDM seal material
	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.	~52.0	
	Inorganic sludges and flocs	0	
	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	<15.0	
	Free non-aqueous liquids	0	

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Powder/Ash..... 0

Inorganic anions (%wt): The inorganic anion content of the waste has not been assessed.

Fluoride..... NE

Chloride..... NE

Iodide..... NE

Cyanide..... NE

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: None expected.

Acrylamide.....

Benzene.....

Chlorinated solvents.....

Formaldehyde.....

Organometallics.....

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):

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids……

Other organic complexants.....

Total complexing agents..... TR

PACKAGING AND CONDITIONING

Container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages
500 l RS drum (0mm Pb)	100.0	0.212	0.212	4

Container type comment: 4 x MOSAIKs Type B(M) no shielding

Range in container waste volume: -

Other information on containers: 4 x MOSAIKs Type B(M) no shielding. There are 3 x cartridges and 1 x pre filter per MOSAIK (Total of 12 cartridges and 4 x pre filters).

Conditioned density (t/m^3): -

Conditioned density comment: -

Other information on conditioning: -

RADIOACTIVITY

Source: Spent cartridges from the submersible caesium removal unit, used for the removal of caesium isotopes from cooling pond water. Contamination by fission products, actinides and activation products.

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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:	Estimated from available data. Taken from WD-CALC-1923
Other information:	-

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	8.53E-03	B B 2			Gd 153		8		
Be 10	3.21E-09	B B 2			Ho 163		8		
C 14	3.70E-02	B B 2			Ho 166m	5.23E-09	B B 2		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	7.04E-05	B B 2			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	2.06E-01	B B 2			Pb 210		8		
Co 60	3.81E-04	B B 2			Bi 208		8		
Ni 59	1.34E-07	B B 2			Bi 210m		8		
Ni 63	4.72E-01	B B 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	5.1E-06	B B 2			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85	1.00E-02	B B 2			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	1.11E+00	B B 2			Th 227		8		
Zr 93	2.8E-05	B B 2			Th 228	2.7E-09	B B 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230	1.22E-08	B B 2		
Nb 93m	2.34E-05	B B 2			Th 232		8		
Nb 94	1.29E-09	B B 2			Th 234	1.89E-06	B B 2		
Mo 93		8			Pa 231	1.07E-09	B B 2		
Tc 97		8			Pa 233	1.82E-06	B B 2		
Tc 99	1.06E-04	B B 2			U 232	1.94E-09	B B 2		
Ru 106		8			U 233		8		
Pd 107	1.31E-06	B B 2			U 234	2.19E-06	B B 2		
Ag 108m	7.98E-04	B B 2			U 235	6.28E-08	B B 2		
Ag 110m		8			U 236	2.25E-07	B B 2		
Cd 109		8			U 238	1.89E-06	B B 2		
Cd 113m	4.02E-05	B B 2			Np 237	1.82E-06	B B 2		
Sn 119m		8			Pu 236		8		
Sn 121m	2.21E-04	B B 2			Pu 238	5.64E-03	B B 2		
Sn 123		8			Pu 239	4.74E-03	B B 2		
Sn 126	1.02E-05	B B 2			Pu 240	4.86E-03	B B 2		
Sb 125	3.84E-04	B B 2			Pu 241	1.78E-01	B B 2		
Sb 126	1.43E-06	B B 2			Pu 242	6.78E-06	B B 2		
Te 125m	9.61E-05	B B 2			Am 241	1.51E-02	B B 2		
Te 127m		8			Am 242m	5.97E-05	B B 2		
I 129	4.62E-07	B B 2			Am 243	1.27E-05	B B 2		
Cs 134	1.09E-01	B B 2			Cm 242	4.93E-05	B B 2		
Cs 135	1.3E-05	B B 2			Cm 243	3.31E-05	B B 2		
Cs 137	1.07E+01	B B 2			Cm 244	3.90E-04	B B 2		
Ba 133	2.09E-08	B B 2			Cm 245	5.47E-09	B B 2		
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	6.08E-05	B B 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	5.50E-03	B B 2			Other a				
Eu 152	1.02E-05	B B 2			Other b/g				
Eu 154	1.81E-03	B B 2			**Total a**	**3.08E-02**	**B B 2**	**0**	
Eu 155	4.14E-04	B B 2			**Total b/g**	**1.28E+01**	**B B 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