

<b>WASTE STREAM</b>	<b>9J60</b>	<b>Ion Siv Unit Post Filters</b>
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**SITE** Hunterston A  
**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Magnox Limited

**WASTE TYPE** ILW

Is the waste subject to Scottish Policy: Yes

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	0.1 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		0.1 m <sup>3</sup>
Comment on volumes:	The MAETP plant was commissioned in 2009. The volume of each post filter is 0.044 m3.	
Uncertainty factors on volumes:	Stock (upper): x 1.2	Arisings (upper) x
	Stock (lower): x 0.8	Arisings (lower) x

**WASTE SOURCE** Filtration of cartridge cooling pond water.

**PHYSICAL CHARACTERISTICS**

General description: Spent post filters that form part of the Modular Active Effluent Treatment Plant. The size of the post filters will not influence the choice of treatment process or disposal container.

Physical components (%wt): Post filter (100%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~0.53

Comment on density: The density of 0.53 t/m<sup>3</sup> assumes that each post filter will have trapped 20g of IONSIV material, giving a total mass of 28.1kg for each post filter.

**CHEMICAL COMPOSITION**

General description and components (%wt): The waste is a spent post filter, which is composed principally of stainless steel supports with some organic material. A post filter will typically hold a maximum of 20g of IONSIV material. Stainless steel (~100%), IONSIV material (<1%) and EPDM seal material (<1%). (EPDM is ethylene diene terpolymer).

Chemical state: Neutral

Chemical form of radionuclides: H-3: Any tritium is likely to be present as water.  
 C-14: The carbon 14 content is insignificant.  
 Cl-36: The chlorine 36 content is insignificant.  
 Se-79: The selenium content is insignificant.  
 Tc-99: The technetium content is insignificant.  
 Ra: The radium isotope content is insignificant.  
 Th: The thorium isotope content is insignificant.  
 U: The uranium isotope content is insignificant.  
 Np: The neptunium content is insignificant.  
 Pu: The chemical form of plutonium isotopes may be plutonium oxides.

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~100.0	The stainless steel is SS316L; nickel and chromium will be major constituents of the stainless steel post filter construction material.	
Other ferrous metals.....	NE		
Iron.....			
Aluminium.....	NE		
Beryllium.....	TR		
Cobalt.....			

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Copper.....	NE	
Lead.....	NE	
Magnox/Magnesium.....	NE	
Nickel.....		
Titanium.....		
Uranium.....		
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. Halogenated plastics and rubbers are not expected in the waste.

	(%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		
Condensation polymers.....	0		
Others.....	0		
Organic ion exchange materials....	0		
Total rubber.....	<1.0		
Halogenated rubber .....	0		
Non-halogenated rubber.....	<1.0	EPDM (ethylene diene terpolymer) 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): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	<1.0	IONSIV Material	
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	0		

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Desiccants/Catalysts.....	
Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	TR
Free non-aqueous liquids.....	0
Powder/Ash.....	0

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

	(%wt)	Type(s) and comment
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:           -

	(%wt)	Type(s) and comment
Combustible metals.....	0	
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 / If any, present in trace quantities only.  
 non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....		
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):

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....		
Total complexing agents.....	0	

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Potential for the waste to contain discrete items: Yes. Stainless Steel so DI by definition

**PACKAGING AND CONDITIONING**

Conditioning method: The waste is expected to be conditioned in a cast iron drum. The drummed waste will be over packed in a 3m3 box. A strategy decision needs to be taken as to whether the 3m3 box will be grouted.

Plant Name: Unknown

Location: Hunterston A Power Station

Plant startup date: -

Total capacity (m<sup>3</sup>/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m<sup>3</sup>/y incoming waste): <1.0

Other information: It is assumed that one post filter will be packaged into one drum, each drum will then be placed into a 3m3 box.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	3m <sup>3</sup> box (round corners)	100.0	0.044	2.9	2

Likely container type comment: -

Range in container waste volume: no significant variability is expected

Other information on containers: The drum is cast iron and the 3m box is stainless steel.

Likely conditioning matrix: Polymer

Other information: Work is in progress to determine the most appropriate matrix. Currently the matrix is anticipated to be 3:1 PFA/OPC.

Conditioned density (t/m<sup>3</sup>): NE

Conditioned density comment: Conditioned density is not estimated.

Other information on conditioning: It is expected that a purpose-built cast iron drum with a 205 mm wall thickness will be used. One filter will be packaged into one drum.

Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
Disposal at a Near Surface / Near Site Disposal Facility	Disposal at LLWR	NE	2024	Medium	Based on experience at other sites (e.g. DNA, SZA, OLD, HPA) expect at least some of the IONSIV Filters to be LLW and suitable for disposal to LLWR. Unlikely to meet metal treatment WAC.

**RADIOACTIVITY**

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Source:	Spent post filters from the Modular Active Effluent Treatment Plant, used for the removal of caesium isotopes from Cartridge 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:	The activities were estimated from the fingerprint for the Cartridge Cooling Pond water sludge from waste stream 9J951 with a total activity of 0.06 TBq for the Cartridge Cooling Pond water.
Other information:	-

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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		8		8	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14		8		8	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36		8		8	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		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	2.04E-03	CC 2		8	Pb 210		8		8
Co 60	2.15E-04	CC 2		8	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63		8		8	Po 210		8		8
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	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	8.06E-03	CC 2		8	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94		8		8	Th 234		8		8
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233	6.61E-09	CC 2		8
Tc 99		8		8	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234	2.45E-08	CC 2		8
Ag 108m		8		8	U 235		8		8
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238		8		8
Cd 113m		8		8	Np 237	6.69E-09	CC 2		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	9.32E-04	CC 2		8
Sn 123		8		8	Pu 239	2E-03	CC 2		8
Sn 126		8		8	Pu 240	2.00E-03	CC 2		8
Sb 125	2.09E-06	CC 2		8	Pu 241	3.24E-02	CC 2		8
Sb 126		8		8	Pu 242		8		8
Te 125m	<5.22E-07	C 3		8	Am 241	2.55E-03	CC 2		8
Te 127m		8		8	Am 242m		8		8
I 129		6		8	Am 243		8		8
Cs 134	2.44E-06	CC 2		8	Cm 242		8		8
Cs 135		8		8	Cm 243	8.12E-05	CC 2		8
Cs 137	1.63E-01	CC 2		8	Cm 244	7.08E-05	CC 2		8
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		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147		8		8	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152		8		8	Other b/g				
Eu 154	2.42E-04	CC 2		8	<b>Total a</b>	<b>7.63E-03</b>	<b>CC 2</b>	<b>0</b>	
Eu 155	5.51E-05	CC 2		8	<b>Total b/g</b>	<b>2.06E-01</b>	<b>CC 2</b>	<b>0</b>	

**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