

WASTE STREAM	9D71	Ion Exchange Material
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SITE Hinkley Point A
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Magnox Limited
WASTE TYPE LLW
 Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	0 m ³
Future arisings -	1.4.2022 - 31.3.2025.....	22.9 m ³
Total future arisings:		22.9 m ³
Total waste volume:		22.9 m ³

Comment on volumes: -
 Uncertainty factors on volumes:
 Stock (upper): x Arisings (upper) x 1.1
 Stock (lower): x Arisings (lower) x 0.5

WASTE SOURCE Spent ion exchange materials arising from the treatment of pond waters.

PHYSICAL CHARACTERISTICS

General description: Spent ion exchange materials arising from the treatment of pond waters. There are no large items which may require special handling. Resins used in the Chemical Water Treatment Plant (CTP), comprising a mixture of cation and anion resin.
 Physical components (%wt): Resin (~85% wt), metal drums (15%)
 Sealed sources: The waste does not contain sealed sources.
 Bulk density (t/m³): ~1.08
 Comment on density: WCH mass divided by volume

CHEMICAL COMPOSITION

General description and components (%wt): Resin (~85% wt), metal drums (15%) The ion exchange material is Amberlite IR120 cation resin. Negligible inorganic resin is present.
 Chemical state: -
 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 chemical form of neptunium has not been determined.
 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.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....			
Other ferrous metals.....	14.7	Mild Steel Drums	
Iron.....	TR	Elemental composition of resin	
Aluminium.....	TR	Elemental composition of resin	
Beryllium.....			
Cobalt.....	TR	Elemental composition of resin	

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Copper.....	TR	Elemental composition of resin
Lead.....		
Magnox/Magnesium.....	TR	Elemental composition of resin
Nickel.....	TR	Elemental composition of resin
Titanium.....	TR	Elemental composition of resin
Uranium.....		
Zinc.....	TR	Elemental composition of resin
Zircaloy/Zirconium.....	0	
Other metals.....	0	

Organics (%wt): Proprietary ion exchange resin and traces of soluble organic material are present.No halogenated plastics or rubbers present.

	(%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....	~85.3	Amberlite IR120 Cation	
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.....			

Other materials (%wt): -

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

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Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	
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.

	(%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: Magnox may be present, but is in such low concentrations so as not to pose a hazard.

	(%wt)	Type(s) and comment
Combustible metals.....		
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 / No toxic metals expected.
non hazardous pollutants:

	(%wt)	
Acrylamide.....		Type(s) and comment
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.....	TR	Elemental composition of resin
Molybdenum.....	TR	Elemental composition of resin
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

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

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Potential for the waste to contain discrete items:

No. In & of itself not a DI; assumed not likely to contain any "rogue" items that could be.

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction Supercompaction (HFC) Incineration Solidification Decontamination Metal treatment Size reduction Decay storage Recycling / reuse Other / various None		100.0

Comment on planned treatments:

-

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known	100.0	1.6

Classification codes for waste expected to be consigned to a landfill facility:

-

Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known			

Opportunities for alternative disposal routing:

-

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

Waste Packaging for Disposal:

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Container	Stream volume %	Waste loading m ³	Number of packages
1/3 Height IP-1 ISO 2/3 Height IP-2 ISO 1/2 Height WAMAC IP-2 ISO 1/2 Height IP-2 Disposal/Re-usable ISO 2m box (no shielding) 4m box (no shielding) Other	100.0	2.4	10

Other information: loading volume of solidified waste based on 36, 200 litre drums per HHISO. Each 1/3 full of waste, remainder encapsulant.

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC). The waste has a current WCH. Inventory information is consistent with the current WCH.

Waste consigned for disposal to LLWR in year of generation: -

Non-Containerised Waste for In-Vault Grouting: (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

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 taken from 1MXN-3HIA-0-WCH-0-4696 V3 and decayed three years to start date of first arising of 01/04/2022.

Other information: -

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	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			6.03E-06	CC 1	Gd 153				8
Be 10				8	Ho 163				8
C 14			1.49E-06	CC 1	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36				8	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			1.66E-07	CC 1	Pb 210				8
Co 60			3.88E-06	CC 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			2.91E-06	CC 1	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			2.34E-03	CC 1	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			1.33E-07	CC 2	Th 234		1.15E-07	CC 2	
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99			8.59E-07	CC 2	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234		1E-07	CC 2	
Ag 108m			1.69E-07	CC 2	U 235		2.49E-09	CC 2	
Ag 110m				8	U 236		1.32E-08	CC 2	
Cd 109				8	U 238		1.15E-07	CC 2	
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238		6.97E-06	CC 1	
Sn 123				8	Pu 239		1.2E-05	CC 1	
Sn 126				8	Pu 240		1.2E-05	CC 1	
Sb 125				8	Pu 241		1.52E-04	CC 1	
Sb 126				8	Pu 242				8
Te 125m				8	Am 241		1.04E-05	CC 1	
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134			1.02E-07	CC 2	Cm 242				8
Cs 135				8	Cm 243		1.16E-09	CC 1	
Cs 137			9.02E-04	CC 2	Cm 244		7.53E-08	CC 1	
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			5.28E-07	CC 1	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151			1.16E-06	CC 2	Other a				8
Eu 152			1.05E-09	CC 2	Other b/g				
Eu 154			4.13E-07	CC 2	Total a	0	4.17E-05	CC 2	
Eu 155				8	Total b/g	0	3.41E-03	CC 2	

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