

WASTE STREAM	9E20	Ion Exchange Material
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SITE Oldbury

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 14.7		
Future arisings:				
Total future arisings:		0.0		
Total waste volume:		14.7		

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: -

Additional information on quantities: -

Uncertainty factors on volumes:

Stock (upper):	x 1.20	Arisings (upper):	x -
Stock (lower):	x 0.80	Arisings (lower):	x -

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

PHYSICAL CHARACTERISTICS

General description: The ion exchange material is stored under water in a tank. It should be easily pumped and have rapid settling characteristics. It would be expected to have a density (flooded with water) of about 1.1 t/m³ with a voidage of 0.2 to 0.35, i.e. 0.2 to 0.35 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.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.1

Comment on density: The bulk density of the waste flooded with water is expected to be about 1.1 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Composition appropriate to proprietary ion exchange materials, which are all organic in nature. A small quantity of sand is present with the ion exchange material. Water in which the ion exchange material is immersed. Proprietary ion exchange materials and sand (~70%wt) and water (~30%wt). The ion exchange materials include Granular Lewatit (phenol formaldehyde based), IRN77, IRN78, IRN163, IR120 and IRA402 (all polystyrene based).

Chemical state: Alkali

Sheet metal proportion / thickness: There are no metallic items present.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	TR	-	
Other ferrous metals.....	TR	-	
Iron.....		-	
Aluminium.....	TR	-	
Beryllium.....	0	-	
Cobalt.....		-	
Copper.....	TR	-	
Lead.....	TR	-	
Magnox/Magnesium.....	TR	Magnox might be present in trace quantities.	
Nickel.....		-	
Titanium.....		-	
Uranium.....		-	
Zinc.....	TR	-	
Zircaloy/Zirconium.....	TR	-	
Other metals.....	TR	Only trace quantities of "other" metals are present.	

Organics (%wt):

	(%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.....	~ 70.0	The ion exchange materials include Granular Lewatit (phenol formaldehyde based), IRN77, IRN78, IRN163, IR120 and IRA402 (all polystyrene based).	
Total rubber.....	TR	-	
Halogenated rubber.....	TR	neoprene	
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):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	TR	-	
Sand.....	-	-	
Glass/Ceramics.....	= 0	-	
Graphite.....	TR	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	= 0	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	~ 30.0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 0	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	TR	-
Chloride.....	TR	-
Iodide.....	TR	-
Cyanide.....	= 0	-
Carbonate.....	= 0.05	-
Nitrate.....	TR	-
Nitrite.....	TR	-
Phosphate.....	TR	-
Sulphate.....	= 1.5	-
Sulphide.....	TR	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	TR	-
Low flash point liquids.....	= 0	-
Explosive materials.....	= 0	-
Phosphorus.....	= 0	-
Hydrides.....	= 0	-
Biological etc. materials.....	TR	-
Biodegradable materials.....	0	-
Putrescible wastes.....	= 0	-
Non-putrescible wastes.....	-	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	TR	-
Higher activity particles.....	-	-
Soluble solids as bulk chemical compounds.....	-	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	0	-
Benzene.....		-
Chlorinated solvents.....		-
Formaldehyde.....		-
Organometallics.....		-
Phenol.....		-
Styrene.....		-
Tri-butyl phosphate.....		-
Other organophosphates.....		-
Vinyl chloride.....		-
Arsenic.....		-
Barium.....		-
Boron.....		-
Boron (in Boral).....		-
Boron (non-Boral).....		-
Cadmium.....		-
Caesium.....		-
Selenium.....		-
Chromium.....		-
Molybdenum.....		-
Thallium.....		-
Tin.....		-
Vanadium.....		-
Mercury compounds.....		-
Others.....		-

Complexing agents (%wt):

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

Physical components:

	Number	Type(s) and comment
Sources.....		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....		-
EEE Type 2.....		-
EEE Type 3.....		-
EEE Type 4.....		-
EEE Type 5.....		-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction Decay storage Low force compaction Supercompaction (HFC) Incineration Drying/dewatering/liquid separation Tie down/fixatives/strippable coating/painting application Decontamination Metal treatment Recycling / reuse Thermal treatment, including vitrification Encapsulation Polymer encapsulation Other physical treatment Other chemical treatment Containerisation Treatment not yet determined None	On-site	100.0

Comments on planned treatments:

-

Conditioning method:

-

Conditioning plants:

Plant Name	Location
OLD AVDS	Oldbury

Likely conditioning matrix:

-

Further information on the conditioning matrix:

-

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	3 m³ RS box	100.0	2.1	2.5	8	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): -
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	100.0		
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

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

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

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 and pond conditions. Values were derived from measurements.

Measurement of radioactivities: The activities quoted were derived from measurements.

Chemical form of radionuclides:

- H-3: The chemical form of tritium will be present as tritiated water.
- C-14: Carbon 14 will be present as graphite dust particles.
- Cl-36: Chlorine 36 may be present in graphite dust particles.
- Se-79: The selenium content is insignificant.
- Tc-99: The technetium content is insignificant.
- I-129: -
- Ra: The radium isotope content is insignificant.
- Th: Traces of Thorium may be present in metallic form, as oxide or as insoluble salts.
- U: Uranium isotopes may be present as natural uranium metal or oxides.
- Np: The neptunium content is insignificant.
- Pu: Plutonium isotopes are expected to be present as trace amounts from minor fuel leakage, probably metallic or oxides.

WASTE STREAM			9E20		Ion Exchange Material				
Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	8.70E-05	C C 2			Gd 153		8		
Be 10					Ho 163		8		
C 14	8.99E-06	C C 2			Ho 166m		8		
Na 22					Tm 170		8		
Al 26	8.00E-06	C C 2			Tm 171		8		
Cl 36	2.00E-06	C C 2			Lu 174		8		
Ar 39					Lu 176		8		
Ar 42					Hf 178n		8		
K 40					Hf 182		8		
Ca 41					Pt 193		8		
Mn 53					Tl 204		8		
Mn 54					Pb 205		8		
Fe 55	2.13E-08	C C 2			Pb 210		8		
Co 60	< 1.00E-06	C 3			Bi 208		8		
Ni 59					Bi 210m		8		
Ni 63	6.32E-05	C C 2			Po 210		8		
Zn 65					Ra 223		8		
Se 79					Ra 225		8		
Kr 81					Ra 226		8		
Kr 85					Ra 228		8		
Rb 87					Ac 227		8		
Sr 90	1.41E-02	C C 2			Th 227		8		
Zr 93					Th 228		8		
Nb 91					Th 229		8		
Nb 92					Th 230		8		
Nb 93m					Th 232		8		
Nb 94					Th 234	1.00E-08	C C 2		
Mo 93					Pa 231		8		
Tc 97					Pa 233		8		
Tc 99					U 232		8		
Ru 106					U 233		8		
Pd 107					U 234	2.01E-08	C C 2		
Ag 108m	< 3.90E-05	C 3			U 235		8		
Ag 110m					U 236	< 1.00E-09	C 3		
Cd 109					U 238	1.00E-08	C C 2		
Cd 113m					Np 237		8		
Sn 119m					Pu 236		8		
Sn 121m					Pu 238	4.44E-06	C C 2		
Sn 123					Pu 239	4.00E-06	C C 2		
Sn 126					Pu 240	7.00E-06	C C 2		
Sb 125					Pu 241	1.47E-04	C C 2		
Sb 126					Pu 242		8		
Te 125m					Am 241	3.43E-05	C C 2		
Te 127m					Am 242m		8		
I 129					Am 243		8		
Cs 134	5.04E-08	C C 2			Cm 242		8		
Cs 135					Cm 243		8		
Cs 137	3.57E-01	C C 2			Cm 244	1.13E-07	C C 2		
Ba 133					Cm 245		8		
La 137					Cm 246		8		
La 138					Cm 248		8		
Ce 144					Cf 249		8		
Pm 145					Cf 250		8		
Pm 147	1.02E-08	C C 2			Cf 251		8		
Sm 147					Cf 252		8		
Sm 151	1.78E-06	C C 2			Unsp a				
Eu 152					Unsp b/g				
Eu 154	< 6.05E-06	C 3			Total a	4.99E-05	*	0	*
Eu 155					Total b/g	3.71E-01	*	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 the 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
* Total calculated from the 114 declared radionuclides