

WASTE STREAM	4B04	Sludge
---------------------	-------------	---------------

	Nickel.....	0
	Titanium.....	0
	Uranium.....	0
	Zinc.....	0
	Zircaloy/Zirconium.....	0
	Other metals.....	0
Organics (%wt):	The waste contains solkafloc cellulose filter material and some oil.	
	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.....	0
	Halogenated rubber	0
	Non-halogenated rubber.....	0
	Hydrocarbons.....	NE
	Oil or grease	NE
	Fuel.....	
	Asphalt/Tarmac (cont.coal tar)...	
	Asphalt/Tarmac (no coal tar)....	
	Bitumen.....	
	Others.....	
	Other organics.....	NE
Other materials (%wt):	-	
	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs.....	~100.0
	Soil.....	0
	Brick/Stone/Rubble.....	0
	Cementitious material.....	0
	Sand.....	NE
	Glass/Ceramics.....	0
	Graphite.....	0
	Desiccants/Catalysts.....	0
	Asbestos.....	0
	Non/low friable.....	
	Moderately friable.....	
	Highly friable.....	
	Free aqueous liquids.....	P
	Free non-aqueous liquids.....	0
	Powder/Ash.....	0

WASTE STREAM**4B04****Sludge**

Inorganic anions (%wt):

Trace quantities only of the listed inorganic anions might be expected.

Fluoride.....	0
Chloride.....	0
Iodide.....	0
Cyanide.....	0
Carbonate.....	0
Nitrate.....	0
Nitrite.....	0
Phosphate.....	0
Sulphate.....	0
Sulphide.....	0

Materials of interest for waste acceptance criteria:

There are no hazardous materials present.

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.....	0
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	0
Reacting with water.....	0
Active particles.....	P
Soluble solids as bulk chemical compounds.....	0

May be present

Hazardous substances / non hazardous pollutants:

This waste is not expected to contain any listed substances.

Acrylamide.....	NE
Benzene.....	NE
Chlorinated solvents.....	NE
Formaldehyde.....	NE
Organometallics.....	NE
Phenol.....	NE
Styrene.....	NE
Tri-butyl phosphate.....	NE
Other organophosphates.....	NE
Vinyl chloride.....	NE
Arsenic.....	NE
Barium.....	NE

WASTE STREAM	4B04	Sludge
---------------------	-------------	---------------

Boron.....	NE
Cadmium.....	NE
Caesium.....	NE
Selenium.....	NE
Chromium.....	NE
Molybdenum.....	NE
Thallium.....	NE
Tin.....	NE
Vanadium.....	NE
Mercury compounds.....	NE
Others.....	NE
Electronic Electrical Equipment (EEE)	
EEE Type 1.....	0
EEE Type 2.....	0
EEE Type 3.....	0
EEE Type 4.....	0
EEE Type 5.....	0

Complexing agents (%wt):	Not yet determined
EDTA.....	NE
DPTA.....	NE
NTA.....	NE
Polycarboxylic acids.....	NE
Other organic complexants.....	NE
Total complexing agents.....	NE

Trace quantities of complexing agents used in the decontamination process may be present.

PACKAGING AND CONDITIONING

Conditioning method:	Sludge will be dewatered prior to encapsulation in cement. Supercompaction will not be used.
Plant Name:	Radwaste Conditioning and Packaging Plant.
Location:	Hunterston B Power Station.
Plant startup date:	~2023
Total capacity (m ³ /y incoming waste):	NE
Target start date for packaging this stream:	-
Throughput for this stream (m ³ /y incoming waste):	NE
Other information:	All waste in a tank will be retrieved when a conditioning campaign is undertaken. It is expected that there will be several campaigns.

WASTE STREAM 4B04 Sludge

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	500 l drum	100.0	~0.24	0.47	167

Likely container type comment: -

Range in container waste volume: -

Other information on containers: Stainless Steel.

Likely conditioning matrix: BFS/OPC

Other information: A cement blend of BFS/OPC has been considered.

Conditioned density (t/m³): NE

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing: No

Treatment	Stream volume (%)	Comment
-	-	-

RADIOACTIVITY

Source: There will be contamination by fission products and activation products.

Uncertainty: The estimate of total activity in stocks is within a factor of 10.

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: -

Other information: The specific activity at various times in the operating history of the plant will vary widely. The estimates are based upon theoretical assessments expected after several years of operation. Other beta/gamma nuclides of arisings and stocks (in TBq/m³) include; Cr51 (1E+1, 4E-3); Co58 (1E+0, 7E-3); Ru103 (4E-9, 6E-12); I125 (5E-9, 2E-11) and Ta182 (7E-1, 1E-2).

WASTE STREAM 4B04 Sludge

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	2E-05	CC 2	2E-05	CC 2	Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	2E-02	CC 2	3E+00	CC 2	Pb 205				
Fe 55	1E+00	CC 2	9E+00	CC 2	Pb 210				
Co 60	4E-01	CC 2	1E+00	CC 2	Bi 208				
Ni 59	1E-02	CC 2	1E-02	CC 2	Bi 210m				
Ni 63	1E+00	CC 2	1E+00	CC 2	Po 210				
Zn 65	2E-04	CC 2	1E-01	CC 2	Ra 223				
Se 79	1.38E-08	CC 2	1.38E-08	CC 2	Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	2E-02	CC 2	2E-02	CC 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	3E-10	CC 2	3E-10	CC 2	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99	3E-06	CC 2	3E-06	CC 2	U 232				
Ru 106	1E-04	CC 2	1E-02	CC 2	U 233				
Pd 107					U 234	3E-06	CC 2	3E-06	CC 2
Ag 108m					U 235	5E-08	CC 2	5E-08	CC 2
Ag 110m					U 236	8E-11			
Cd 109					U 238	9E-07	CC 2	9E-07	CC 2
Cd 113m					Np 237	4E-07	CC 2	4E-07	CC 2
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239	5E-04	CC 2	5E-04	CC 2
Sn 126	4.35E-08	CC 2	4.35E-08	CC 2	Pu 240	9E-04	CC 2	9E-04	CC 2
Sb 125					Pu 241				
Sb 126					Pu 242	2E-06	CC 2	2E-06	CC 2
Te 125m					Am 241	2E-03	CC 2	8E-04	CC 2
Te 127m					Am 242m				
I 129					Am 243	8E-06	CC 2	8E-06	CC 2
Cs 134	1E-03	CC 2	1E-02	CC 2	Cm 242				
Cs 135	9E-08	CC 2	9E-08	CC 2	Cm 243				
Cs 137	2E-02	CC 2	2E-02	CC 2	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	7E-05	CC 2	2E-02	CC 2	Cf 249				
Pm 145					Cf 250				
Pm 147	2E-03	CC 2	2E-02	CC 2	Cf 251				
Sm 147	7E-14				Cf 252				
Sm 151	3E-05	CC 2	3E-05	CC 2	Other a				
Eu 152					Other b/g	2E-02	CC 2	1.17E+01	CC 2
Eu 154	3E-03	CC 2	6E-03	CC 2	Total a	3.41E-03	CC 2	2.21E-03	CC 2
Eu 155					Total b/g	2.50E+00	CC 2	2.59E+01	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