

WASTE STREAM	9A53	FED Zirconium
---------------------	-------------	----------------------

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	0		
Iron.....			
Aluminium.....	0		
Beryllium.....	0		
Cobalt.....			
Copper.....	0		
Lead.....	0		
Magnox/Magnesium.....	TR		
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....	0		
Zircaloy/Zirconium.....	~100.0		
Other metals.....	0	The waste will be zirconium with impurities incorporated in the zirconium.	

Organics (%wt): This loose Zirconium is currently stored in the same vault as the drums of ion exchange material, although in different sub-sections. It may be possible that the Zirconium has been contaminated with the ion exchange material that has leaked from the drum

	(%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....	TR		
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.....	TR		

Other materials (%wt): Graphite contamination.

WASTE STREAM	9A53	FED Zirconium
---------------------	-------------	----------------------

	(%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.....	0		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	TR		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	TR		
Free non-aqueous liquids.....	0		
Powder/Ash.....	P		

Inorganic anions (%wt): Inorganic anions are not expected to be present at greater than trace concentrations.

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

Materials of interest for waste acceptance criteria: There are no identified materials likely to represent a fire or other non-radiological hazard.

	(%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.....		

WASTE STREAM	9A53	FED Zirconium
---------------------	-------------	----------------------

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

Hazardous substances / None expected
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.....		

WASTE STREAM 9A53 FED Zirconium

Complexing agents (%wt): Yes

(%wt) Type(s) and comment

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants.....

Total complexing agents..... TR

Potential for the waste to contain discrete items: Not yet determined. Other HDRIs incl T/C pieces etc (typ. stainless) are DIs by definition

PACKAGING AND CONDITIONING

Conditioning method: This stream will be co-packaged together in Concrete boxes (9A61, 9A62, 9A67, 9A32, 9A40, 9A48, 9A73). The remainder of vault 1 waste will be co-packaged together in Type VI DCIC containers (9A25, 9A31, 9A39, 9A47, 9A52, 9A60 and 9A66). Packages for vault 1 are assigned to 9A25, 9A32 & 9A73.

Plant Name: -

Location: Berkeley Site

Plant startup date: -

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m³/y incoming waste): -

Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: -

Other information: -

Conditioned density (t/m³): -

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing: -

WASTE STREAM**9A53****FED Zirconium**

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

RADIOACTIVITY

Source: Activation when the associated fuel elements were irradiated, of nuclides incorporated in the zirconium. Contamination by fission products and actinides when the fuel elements were in the fuel pond.

Uncertainty: 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: Specific activity is a function of Station operating history. Values were derived from calculations of induced activity and estimates of likely contamination.

Other information: -

WASTE STREAM

9A53

FED Zirconium

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	<8.63E-01	D 3			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	3.00E-02	CC 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26	<8E-07	D 3			Tm 171		8		
Cl 36	<2E-03	C 3			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41	<4E-05	D 3			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	<1.09E-05	D 3			Pb 210		8		
Co 60	<4.17E-02	D 3			Bi 208		8		
Ni 59	<7E-04	D 3			Bi 210m		8		
Ni 63	1.80E-01	DD 2			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	3.50E-04	CC 2			Th 227		8		
Zr 93	5E-03	CC 2			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92	1E-07	CC 2			Th 230		8		
Nb 93m	4.49E-03	CC 2			Th 232		8		
Nb 94		8			Th 234	7E-07	CC 2		
Mo 93	<5.99E-03	D 3			Pa 231		8		
Tc 97		8			Pa 233	4.16E-08	CC 2		
Tc 99	<1E-03	D 3			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	6.04E-07	CC 2		
Ag 108m		8			U 235	2E-08	CC 2		
Ag 110m		8			U 236	5.00E-08	CC 2		
Cd 109		8			U 238	7E-07	CC 2		
Cd 113m	<1.42E-04	D 3			Np 237	4.16E-08	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m	<1.64E-02	D 3			Pu 238	7.11E-05	CC 2		
Sn 123		8			Pu 239	2E-04	CC 2		
Sn 126	3.04E-09	CC 2			Pu 240	2.00E-04	CC 2		
Sb 125	9.10E-07	CC 2			Pu 241	1.46E-03	CC 2		
Sb 126		8			Pu 242	6E-08	CC 2		
Te 125m	2.28E-07	CC 2			Am 241	3.44E-04	CC 2		
Te 127m		8			Am 242m	3.71E-07	CC 2		
I 129		8			Am 243	8.00E-08	CC 2		
Cs 134		8			Cm 242	3.06E-07	CC 2		
Cs 135	6E-09	CC 2			Cm 243	4.25E-08	CC 2		
Cs 137	4.95E-04	CC 2			Cm 244	2.25E-07	CC 2		
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	3.89E-04	CC 2			Cf 250		8		
Pm 147	3.81E-09	CC 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	<1.78E-02	D 3			Other a				
Eu 152	<1.39E+00	D 3			Other b/g				
Eu 154	<5.95E-01	D 3			Total a	8.17E-04	CC 2	0	
Eu 155	2.38E-03	CC 2			Total b/g	3.16E+00	CC 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