

WASTE STREAM

9A52

FED Zirconium

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 is zirconium with impurities incorporated in the zirconium.

Organics (%wt):

The loose Zirconium is currently stored under the drums of ion exchange material in the vaults, which will have corroded to an extent. Therefore, it is likely to be contaminated with spilt Lewatit DN, the organic ion exchange material.

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**9A52****FED Zirconium**

Inorganic ion exchange materials. TR
 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.
 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.

Combustible metals..... 0
 Low flash point liquids..... 0
 Explosive materials..... 0
 Phosphorus..... 0
 Hydrides..... 0
 Biological etc. materials..... 0
 Biodegradable materials.....
 Putrescible wastes..... 0
 Non-putrescible wastes.....
 Corrosive materials..... 0
 Pyrophoric materials..... 0
 Generating toxic gases..... 0
 Reacting with water..... 0
 Active particles.....

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	Soluble solids as bulk chemical compounds.....
Hazardous substances / non hazardous pollutants:	None expected.
	Acrylamide.....
	Benzene.....
	Chlorinated solvents.....
	Formaldehyde.....
	Organometallics.....
	Phenol.....
	Styrene.....
	Tri-butyl phosphate.....
	Other organophosphates.....
	Vinyl chloride.....
	Arsenic.....
	Barium.....
	Boron.....
	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):	Yes
	EDTA.....
	DPTA.....
	NTA.....
	Polycarboxylic acids.....
	Other organic complexants.....
	Total complexing agents..... TR

PACKAGING AND CONDITIONING

Conditioning method: This stream will be co-packaged with 9A25, 9A31, 9A39, 9A47, 9A60 and 9A66 in Type VI DCIC containers. Remainder of vault 1 waste streams will be co-packaged together in Concrete boxes (9A61, 9A62, 9A67, 9A32, 9A40, 9A48, 9A53, 9A73).

WASTE STREAM	9A52	FED Zirconium
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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:

Treatment	Stream volume (%)	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 9A52 FED Zirconium

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	<3.06E-01	D 3			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	3.00E-02	DD 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26	<6E-07	D 3			Tm 171		8		
Cl 36	<2E-03	D 3			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41	<3E-05	D 3			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	<9.40E-06	D 3			Pb 210		8		
Co 60	<2.06E-02	D 3			Bi 208		8		
Ni 59	<6E-04	D 3			Bi 210m		8		
Ni 63	1.84E-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	3.76E-04	CC 2			Th 227		8		
Zr 93	4E-03	CC 2			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92	8E-08	CC 2			Th 230		8		
Nb 93m	3.03E-03	CC 2			Th 232		8		
Nb 94	6.00E-08	CC 2			Th 234	7E-07	CC 2		
Mo 93	<5.00E-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	9.81E-08	CC 2			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	<1.65E-04	D 3			Np 237	4.16E-08	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m	<1.70E-02	D 3			Pu 238	7.28E-05	CC 2		
Sn 123		8			Pu 239	2E-04	CC 2		
Sn 126	3.04E-09	DD 2			Pu 240	2.00E-04	CC 2		
Sb 125		8			Pu 241	1.69E-03	CC 2		
Sb 126		8			Pu 242	6E-08	CC 2		
Te 125m		8			Am 241	4.36E-04	CC 2		
Te 127m		8			Am 242m	3.76E-07	CC 2		
I 129		8			Am 243	8.00E-08	CC 2		
Cs 134	1.64E-07	CC 2			Cm 242	3.11E-07	CC 2		
Cs 135	6E-09	CC 2			Cm 243	3.80E-08	CC 2		
Cs 137	4.56E-04	CC 2			Cm 244	2.52E-07	CC 2		
Ba 133	9.53E-08	CC 2			Cm 245		8		
La 137		8			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145	3.13E-04	CC 2			Cf 250		8		
Pm 147	3.77E-09	CC 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	<1.82E-02	D 3			Other a				
Eu 152	<1.62E+00	D 3			Other b/g				
Eu 154	<7.58E-01	D 3			Total a	9.10E-04	CC 2	0	
Eu 155	1.83E-03	CC 2			Total b/g	2.98E+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