

<b>WASTE STREAM</b>	<b>7V29</b>	<b>Vulcan Contact Handled ILW</b>
---------------------	-------------	-----------------------------------

**SITE** Dounreay (Vulcan)

**SITE OWNER** Ministry of Defence

**WASTE CUSTODIAN** Ministry of Defence

**WASTE TYPE** ILW; SPD1

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	0 m <sup>3</sup>
Future arisings -	1.4.2019 - 31.3.2020.....	~2.6 m <sup>3</sup>
	1.4.2021 - 31.3.2030.....	~5.0 m <sup>3</sup>
Total future arisings:		7.6 m <sup>3</sup>
Total waste volume:		7.6 m <sup>3</sup>

Comment on volumes: The waste arisings will be dependant on future decommissioning operation timescales which have still to be confirmed. New process therefore waste volumes yet to be confirmed.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 2.0  
 Stock (lower): x Arisings (lower) x 0.5

**WASTE SOURCE** The waste will arise from the removal of activated stainless steel components from the reactor.

**PHYSICAL CHARACTERISTICS**

General description: Stainless steel components of various size and mass with trace exotic metallics. Secondary wastes in the form of swabs and contaminated RPE/PPE from characterisation and decontamination. There has been no physical/chemical changes to the waste.

Physical components (%wt): Estimated stainless steel 70%, perspex 10%, aluminium 8%, PVC/rubber 6%, paper 6%.

Sealed sources: Not yet determined.

Bulk density (t/m<sup>3</sup>): ~0.3

Comment on density: Based on typical payload in a CHILW drum.

**CHEMICAL COMPOSITION**

General description and components (%wt): Estimated stainless steel 70%, perspex 10%, aluminium 8%, PVC/rubber 6%, paper 6%.

Chemical state: Neutral

Chemical form of radionuclides: H-3: To be determined  
 C-14: To be determined  
 Cl-36: To be determined  
 Se-79: To be determined  
 Tc-99: To be determined  
 I-129: To be determined  
 Ra: To be determined  
 Th: To be determined  
 U: To be determined  
 Np: To be determined  
 Pu: To be determined

Metals and alloys (%wt): Metal proportions to be determined.

Stainless steel.....	~70.0
Other ferrous metals.....	NE
Iron.....	NE
Aluminium.....	~8.0
Beryllium.....	0
Cobalt.....	0
Copper.....	0
Lead.....	0

**WASTE STREAM****7V29****Vulcan Contact Handled ILW**

	Magnox/Magnesium.....	0
	Nickel.....	0
	Titanium.....	0
	Uranium.....	0
	Zinc.....	0
	Zircaloy/Zirconium.....	TR
	Other metals.....	0
Organics (%wt):	The waste contains small amounts of organic material.	
	Total cellulosics.....	~6.0
	Paper, cotton.....	6.0
	Wood.....	0
	Halogenated plastics .....	~10.0
	Total non-halogenated plastics.....	0
	Condensation polymers.....	
	Others.....	
	Organic ion exchange materials....	0
	Total rubber.....	6.0
	Halogenated rubber .....	NE
	Non-halogenated rubber.....	NE
	Hydrocarbons.....	0
	Oil or grease .....	
	Fuel.....	
	Asphalt/Tarmac (cont.coal tar)...	
	Asphalt/Tarmac (no coal tar)....	
	Bitumen.....	
	Others.....	
	Other organics.....	0
Other materials (%wt):	No other materials estimated.	
	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs.....	0
	Soil.....	0
	Brick/Stone/Rubble.....	0
	Cementitious material.....	0
	Sand.....	0
	Glass/Ceramics.....	0
	Graphite.....	0
	Desiccants/Catalysts.....	0
	Asbestos.....	0
	Non/low friable.....	0
	Moderately friable.....	0
	Highly friable.....	0
	Free aqueous liquids.....	0
	Free non-aqueous liquids.....	0

**WASTE STREAM**

**7V29**

**Vulcan Contact Handled ILW**

	Powder/Ash.....	0
Inorganic anions (%wt):	To be determined.	
	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:	Aluminium	
	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.....	NE
	Soluble solids as bulk chemical compounds.....	0
Hazardous substances / non hazardous pollutants:	Aluminium	
	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

**WASTE STREAM 7V29 Vulcan Contact Handled ILW**

Barium..... NE  
 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..... 0  
 DPTA..... 0  
 NTA..... 0  
 Polycarboxylic acids..... 0  
 Other organic complexants..... NE  
 Total complexing agents..... NE

May be decontamination agents  
 in the form of decon wipes.

**PACKAGING AND CONDITIONING**

Conditioning method: Not determined.  
 Plant Name: -  
 Location: -  
 Plant startup date: -  
 Total capacity (m<sup>3</sup>/y incoming waste): -  
 Target start date for packaging this stream: -  
 Throughput for this stream (m<sup>3</sup>/y incoming waste): -  
 Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	Not specified	100.0	NE	NE	NE

**WASTE STREAM****7V29****Vulcan Contact Handled ILW**

Likely container type comment: The waste will continue to be stored in 200 litre drums.

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: Not Specified

Other information: -

Conditioned density (t/m<sup>3</sup>): -

Conditioned density comment: -

Other information on conditioning: The waste will continue to be stored in 200 litre drums until a disposal route is available.

Opportunities for alternative disposal routing: Not yet determined

Treatment	Stream volume (%)	Comment
-	-	-

**RADIOACTIVITY**

Source: The activation and surface contamination of metallic components.

Uncertainty: Confirmation after characterisation.

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: Confirmation after characterisation.

Other information: -

**WASTE STREAM**

**7V29**

**Vulcan Contact Handled ILW**

Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					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					Pb 205				
Fe 55					Pb 210				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137					Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152					Other b/g				
Eu 154					<b>Total a</b>	<b>0</b>			<b>NE</b>
Eu 155					<b>Total b/g</b>	<b>0</b>			<b>NE</b>

**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