



**WASTE STREAM**

**2D200**

**Contact Handled ILW from Harwell**

	Lead.....	~1.3	
	Magnox/Magnesium.....	TR	
	Nickel.....	TR	
	Titanium.....	TR	
	Uranium.....	TR	
	Zinc.....	TR	
	Zircaloy/Zirconium.....	TR	
	Other metals.....	~20.5	Cadmium, Gold, Iron, Magnesium, Nickel, Silver, Tin.
Organics (%wt):	Halogenated plastics include PVC, Non-halogenated plastics include perspex and polystyrene, condensation polymers include bakelite		
	Total cellulosics.....	~1.5	
	Paper, cotton.....	~1.1	
	Wood.....	~0.40	
	Halogenated plastics .....	~6.8	Contains PVC.
	Total non-halogenated plastics.....	~1.1	Contains perspex and polystyrene.
	Condensation polymers.....	TR	Contains nylon and bakelite.
	Others.....	~1.1	
	Organic ion exchange materials....	TR	
	Total rubber.....	~1.0	
	Halogenated rubber .....	~1.0	
	Non-halogenated rubber.....	TR	
	Hydrocarbons.....	<1.0	
	Oil or grease .....	TR	
	Fuel.....	0	
	Asphalt/Tarmac (cont.coal tar)...	0	
	Asphalt/Tarmac (no coal tar)....	0	
	Bitumen.....	<1.0	
	Others.....	0	
	Other organics.....	6.7	
Other materials (%wt):	Other material includes Brick/Stone/Rubble (1.8%), Cementitious material (1.1%), Glass/Ceramics 0.7%.		
	Inorganic ion exchange materials.	TR	
	Inorganic sludges and flocs.....	TR	
	Soil.....	TR	
	Brick/Stone/Rubble.....	~1.8	
	Cementitious material.....	~1.1	
	Sand.....	TR	
	Glass/Ceramics.....	~0.70	
	Graphite.....	TR	
	Desiccants/Catalysts.....		
	Asbestos.....	TR	
	Non/low friable.....	NE	

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	Moderately friable.....	NE	
	Highly friable.....	NE	
	Free aqueous liquids.....	TR	
	Free non-aqueous liquids.....	TR	
	Powder/Ash.....	TR	Trace amount of Euctectic powder.
Inorganic anions (%wt):	Carbonate ions are from solidified sodium and potassium.		
	Fluoride.....	TR	
	Chloride.....	TR	
	Iodide.....	TR	
	Cyanide.....	0	
	Carbonate.....	~0.20	
	Nitrate.....	P	
	Nitrite.....	TR	
	Phosphate.....	TR	
	Sulphate.....	TR	
	Sulphide.....	TR	
Materials of interest for waste acceptance criteria:	-		
	Combustible metals.....	P	
	Low flash point liquids.....	0	
	Explosive materials.....	0	
	Phosphorus.....	P	Trace amounts present.
	Hydrides.....	P	Trace amounts present.
	Biological etc. materials.....	P	Trace amounts present.
	Biodegradable materials.....	0	
	Putrescible wastes.....		
	Non-putrescible wastes.....		
	Corrosive materials.....	P	Trace amounts present.
	Pyrophoric materials.....	P	Trace amounts present.
	Generating toxic gases.....	0	
	Reacting with water.....	P	Trace amounts present.
	Active particles.....	P	
	Soluble solids as bulk chemical compounds.....	NE	
Hazardous substances / non hazardous pollutants:	The waste contains Cadmium and Tin.		
	Acrylamide.....	NE	
	Benzene.....	NE	
	Chlorinated solvents.....	NE	
	Formaldehyde.....	NE	
	Organometallics.....	NE	
	Phenol.....	NE	
	Styrene.....	NE	

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Tri-butyl phosphate.....	0	
Other organophosphates.....	NE	
Vinyl chloride.....	P	As PVC.
Arsenic.....	NE	
Barium.....	NE	
Boron.....	NE	
Cadmium.....	P	
Caesium.....	NE	
Selenium.....	NE	
Chromium.....	P	
Molybdenum.....	P	
Thallium.....	NE	
Tin.....	P	
Vanadium.....	P	
Mercury compounds.....	NE	
Others.....	NE	
Electronic Electrical Equipment (EEE)		
EEE Type 1.....	<0.10	
EEE Type 2.....	<0.10	
EEE Type 3.....	<0.10	
EEE Type 4.....	<0.10	
EEE Type 5.....	<0.10	
Complexing agents (%wt):	Yes	
EDTA.....	NE	
DPTA.....	NE	
NTA.....	NE	
Polycarboxylic acids.....	NE	
Other organic complexants.....	NE	
Total complexing agents.....	P	

**PACKAGING AND CONDITIONING**

Conditioning method:	At present there is no disposal route for the CHILW drums, however it is believed that with an extension to the current LOC a portion of this population could be processed through the Waste Treatment Complex (WTC). These drums could then be supercompacted in WTC and loaded into a basket within a 500 l drum such that there is a cement annulus between the basket and the drum skin. Future Waste Treatment Complex (WTC) facilities are currently projected to use a similar treatment method.
Plant Name:	Waste Treatment Complex (future capabilities are anticipated to be titled WTC2 & WTC3).
Location:	Sellafield.
Plant startup date:	1997 (It is anticipated that WTC2 will become operational in ~2034 and WTC3 in ~2061).
Total capacity (m <sup>3</sup> /y incoming waste):	NE
Target start date for packaging this stream:	-

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Throughput for this stream (m<sup>3</sup>/y incoming waste): NE

Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	500 l drum (basket for waste)	100.0	~1.1	~0.504	484

Likely container type comment: -

Range in container waste volume: The reported waste loading is for the current WTC (supercompaction) process. Typically between 1 and 10 compacted 200 litre drums will be loaded in to a 500 litre drum, with an average of 5.6. The range and variability for WTC2 & WTC3 have yet to be assessed, although it is assumed that the values will be similar to those for the current WTC facility.

Other information on containers: Stainless Steel

Likely conditioning matrix: Pulverised fuel ash/Ordinary Portland cement mixture

Other information: A PFA/OPC grout mix is used to generate the grout annulus which surrounds the compacted feed drums in a WTC product drum. The conditioning matrix relevant to future facilities (WTC2 and WTC3) is currently unknown.

Conditioned density (t/m<sup>3</sup>): 2.1

Conditioned density comment: Conditioned density calculated using data from current WTC product drum stock. The density is typically between 1.8 and 2.6 t/m<sup>3</sup>, although values outside of this range are possible.

Other information on conditioning: -

Opportunities for alternative disposal routing: No

Treatment	Stream volume (%)	Comment
-	-	-

## RADIOACTIVITY

Source: The source of radioactivity is from glovebox and cell operations at Harwell, Winfrith site and NDS waste.

Uncertainty: The specific activity uncertainty is based on records of arisings.

Definition of total alpha and total beta/gamma: The total alpha and total beta/gamma are the sum of the individual radionuclide activities.

Measurement of radioactivities: Specific activity data has been derived using measured activity and dividing by the measured waste volume.

Other information: -

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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	3.58E-01	BB 2			Gd 153				
Be 10					Ho 163				
C 14	2.29E-06	BB 2			Ho 166m				
Na 22	6.57E-08	BB 2			Tm 170				
Al 26					Tm 171				
Cl 36	3.73E-07	BB 2			Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40	8.28E-12	BB 2			Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204	1.73E-07	BB 2		
Mn 54	9.07E-12	BB 2			Pb 205				
Fe 55	2.17E-05	BB 2			Pb 210	1.06E-05	BB 2		
Co 60	2.52E-06	BB 2			Bi 208				
Ni 59					Bi 210m				
Ni 63	5.39E-04	BB 2			Po 210	5.31E-12	BB 2		
Zn 65					Ra 223				
Se 79	5.08E-10	BB 2			Ra 225				
Kr 81					Ra 226				
Kr 85	2.69E-05	BB 2			Ra 228	5.81E-06	BB 2		
Rb 87					Ac 227	2.13E-07	BB 2		
Sr 90	3.20E-04	BB 2			Th 227				
Zr 93	3.81E-09	BB 2			Th 228	5.82E-06	BB 2		
Nb 91					Th 229	3.52E-07	BB 2		
Nb 92					Th 230				
Nb 93m	7.93E-11	BB 2			Th 232	5.86E-06	BB 2		
Nb 94					Th 234				
Mo 93	5.30E-06	BB 2			Pa 231	3.98E-05	BB 2		
Tc 97					Pa 233				
Tc 99	2.34E-05	BB 2			U 232	7.19E-07	BB 2		
Ru 106	6.15E-09	BB 2			U 233	1.48E-05	BB 2		
Pd 107					U 234	3.69E-05	BB 2		
Ag 108m	1.60E-13	BB 2			U 235	1.95E-06	BB 2		
Ag 110m					U 236	2.10E-07	BB 2		
Cd 109	5.83E-08	BB 2			U 238	5.47E-05	BB 2		
Cd 113m					Np 237	3.07E-05	BB 2		
Sn 119m					Pu 236				
Sn 121m					Pu 238	2.66E-02	BB 2		
Sn 123					Pu 239	8.39E-03	BB 2		
Sn 126	2.45E-11	BB 2			Pu 240	7.66E-03	BB 2		
Sb 125	2.41E-09	BB 2			Pu 241	3.28E-01	BB 2		
Sb 126					Pu 242	4.51E-06	BB 2		
Te 125m					Am 241	1.18E-02	BB 2		
Te 127m					Am 242m				
I 129	1.04E-10	BB 2			Am 243	2.58E-06	BB 2		
Cs 134	1.92E-05	BB 2			Cm 242	4.71E-12	BB 2		
Cs 135	4.14E-08	BB 2			Cm 243	3.97E-14	BB 2		
Cs 137	4.24E-04	BB 2			Cm 244	3.27E-05	BB 2		
Ba 133	1.85E-07	BB 2			Cm 245				
La 137					Cm 246				
La 138					Cm 248	3.64E-07	BB 2		
Ce 144	9.14E-09	BB 2			Cf 249	1.39E-07	BB 2		
Pm 145					Cf 250				
Pm 147	1.40E-04	BB 2			Cf 251				
Sm 147					Cf 252	2.53E-07	BB 2		
Sm 151	1.42E-06	BB 2			Other a	1.58E-06	BB 2		
Eu 152	4.36E-08	BB 2			Other b/g	7.81E-08	BB 2		
Eu 154	1.32E-06	BB 2			<b>Total a</b>	<b>5.47E-02</b>	<b>BB 2</b>	<b>0</b>	
Eu 155	3.54E-09	BB 2			<b>Total b/g</b>	<b>6.88E-01</b>	<b>BB 2</b>	<b>0</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