



**WASTE STREAM**

**9J33**

**CCP Sludge**

Nickel.....  
 Titanium.....  
 Uranium.....  
 Zinc..... 0  
 Zircaloy/Zirconium..... 0  
 Other metals..... TR

"Other" metals include nickel, chromium, cobalt, calcium and strontium at trace quantities.

Organics (%wt):

Small amounts of rubber coating from pond walls, hydraulic fluid and oil spillage, and some ion exchange resins, may be present.

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.... TR  
 Total rubber..... TR  
     Halogenated rubber ..... TR  
     Non-halogenated rubber..... TR  
 Hydrocarbons.....  
     Oil or grease .....  
     Fuel.....  
     Asphalt/Tarmac (cont.coal tar)...  
     Asphalt/Tarmac (no coal tar)....  
     Bitumen.....  
     Others.....  
 Other organics..... TR

Other materials (%wt):

-  
 Inorganic ion exchange materials. 0  
 Inorganic sludges and flocs..... ~100.0  
 Soil..... 0  
 Brick/Stone/Rubble..... 0  
 Cementitious material..... 0  
 Sand.....  
 Glass/Ceramics..... 0  
 Graphite..... 0  
 Desiccants/Catalysts.....  
 Asbestos..... 0  
     Non/low friable.....  
     Moderately friable.....  
     Highly friable.....

Including approximately 1% aluminium hydroxide and 2% magnesium hydroxide

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	Free aqueous liquids.....	P
	Free non-aqueous liquids.....	TR
	Powder/Ash.....	0
Inorganic anions (%wt):	Some ferrous-ferro-cyanide anticipated.	
	Fluoride.....	TR
	Chloride.....	TR
	Iodide.....	TR
	Cyanide.....	NE
	Carbonate.....	TR
	Nitrate.....	TR
	Nitrite.....	TR
	Phosphate.....	TR
	Sulphate.....	TR
	Sulphide.....	TR

Materials of interest for waste acceptance criteria: The waste is unlikely to present a fire hazard, but this requires confirmation since Magnox may be present and will ignite under appropriate conditions. Potassium ferrous-ferro-cyanide may be hazardous.

Combustible metals.....	~2.0
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.....	~2.0
Active particles.....	
Soluble solids as bulk chemical compounds.....	

Hazardous substances / non hazardous pollutants:

-
Acrylamide.....
Benzene.....
Chlorinated solvents.....
Formaldehyde.....
Organometallics.....
Phenol.....
Styrene.....
Tri-butyl phosphate.....
Other organophosphates.....

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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): No  
     EDTA.....  
     DPTA.....  
     NTA.....  
     Polycarboxylic acids.....  
     Other organic complexants.....  
     Total complexing agents..... 0

**PACKAGING AND CONDITIONING**

Conditioning method: The waste is expected to be encapsulated in a BFS/OPC matrix. There is no intention to first supercompact the waste.  
 Plant Name: WILWREP  
 Location: Hunterston A Decommissioning Site  
 Plant startup date: -  
 Total capacity (m<sup>3</sup>/y incoming waste): ~100.0  
 Target start date for packaging this stream: 2019  
 Throughput for this stream (m<sup>3</sup>/y incoming waste): ~60.0  
 Other information: All the waste being held in a tank is expected to be retrieved when a conditioning campaign is undertaken. Waste will be co-packaged with stream 9J03

**WASTE STREAM 9J33 CCP Sludge**

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
	3m³ drum	100.0	~0.585	2.2	87

Likely container type comment: -

Range in container waste volume: Not yet determined. No significant variability is expected.

Other information on containers: The container material is expected to be stainless steel.

Likely conditioning matrix: Blast Furnace Slag / Ordinary Portland Cement

Other information: The matrix is expected to be 9:1 BFS/OPC.

Conditioned density (t/m³): ~2.0

Conditioned density comment: The conditioned density range is not estimated.

Other information on conditioning: Wet ILW recovery and encapsulation plant used to condition Waste.

Opportunities for alternative disposal routing:

Treatment	Stream volume (%)	Comment
-	-	-

**RADIOACTIVITY**

Source: The principal source of radioactivity is Cs-137, Sr-90 and Pu-241 from fuel.

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: Data has been taken from CALC 1064 for SRT2 and SRT3 and CALC 4125 for CCP sludge and SRT 1 as these are the major constituents and an average taken. sludge and SRT 1 as these are the major constituents and a weighted average taken.

Other information: -

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**CCP Sludge**

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	1.81E-04	CC 1			Gd 153		8		
Be 10	5.11E-08	CC 2			Ho 163	5.64E-08	CC 2		
C 14	3.52E-05	CC 1			Ho 166m	1.75E-05	CC 2		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1.14E-06	CC 1			Lu 174	1.21E-09	CC 2		
Ar 39	2.78E-05	CC 2			Lu 176		8		
Ar 42		8			Hf 178n	2.11E-05	CC 2		
K 40		8			Hf 182		8		
Ca 41	2.33E-06	CC 2			Pt 193	1.95E-05	CC 2		
Mn 53		8			Tl 204	3.46E-06	CC 2		
Mn 54		8			Pb 205		8		
Fe 55	1.44E-05	CC 1			Pb 210		8		
Co 60	5.90E-05	CC 1			Bi 208		8		
Ni 59	1.57E-06	CC 2			Bi 210m		8		
Ni 63	5.79E-05	CC 1			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	7.57E-08	CC 2			Ra 225		8		
Kr 81	4.26E-07	CC 2			Ra 226		8		
Kr 85	1.14E-03	CC 2			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	1.63E-02	CC 1			Th 227		8		
Zr 93	3.06E-06	CC 2			Th 228	3.67E-08	CC 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	1.3E-05	CC 2			Th 232		8		
Nb 94	2.79E-06	CC 1			Th 234	2.53E-06	CC 2		
Mo 93	6.38E-08	CC 2			Pa 231		8		
Tc 97		8			Pa 233	2.63E-07	CC 2		
Tc 99	2.25E-05	CC 1			U 232	3.56E-08	CC 2		
Ru 106	2.17E-08	CC 1			U 233	5.75E-08	CC 2		
Pd 107	2.15E-07	CC 2			U 234	3.36E-06	CC 1		
Ag 108m	2.86E-06	CC 1			U 235	6.13E-08	CC 1		
Ag 110m		8			U 236	3.32E-07	CC 1		
Cd 109		8			U 238	2.53E-06	CC 1		
Cd 113m	6.27E-06	CC 2			Np 237	2.64E-07	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m	3.05E-05	CC 2			Pu 238	1.10E-03	CC 1		
Sn 123		8			Pu 239	1.16E-03	CC 1		
Sn 126	7.34E-07	CC 2			Pu 240	1.15E-03	CC 1		
Sb 125	1.35E-06	CC 1			Pu 241	2.08E-02	CC 1		
Sb 126	1.03E-07	CC 2			Pu 242	2.30E-06	CC 2		
Te 125m	3.39E-07	CC 2			Am 241	5.22E-03	CC 1		
Te 127m		8			Am 242m	7.03E-06	CC 2		
I 129	3.1E-07	CC 2			Am 243	8.58E-06	CC 2		
Cs 134	1.34E-07	CC 1			Cm 242	5.80E-06	CC 1		
Cs 135	9.27E-07	CC 2			Cm 243	7.76E-06	CC 1		
Cs 137	9.87E-02	CC 1			Cm 244	9.28E-05	CC 1		
Ba 133	3.50E-06	CC 1			Cm 245	1.26E-08	CC 2		
La 137	4.30E-09	CC 2			Cm 246	1.56E-09	CC 2		
La 138		8			Cm 248		8		
Ce 144	1.31E-09	CC 1			Cf 249		8		
Pm 145	7.79E-08	CC 2			Cf 250		8		
Pm 147	1.70E-05	CC 1			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	1.08E-03	CC 1			Other a				
Eu 152	4.89E-06	CC 1			Other b/g				
Eu 154	1.32E-04	CC 1			<b>Total a</b>	<b>8.75E-03</b>	<b>CC 2</b>	<b>0</b>	
Eu 155	1.95E-05	CC 1			<b>Total b/g</b>	<b>1.39E-01</b>	<b>CC 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