

WASTE STREAM	2C06	Ceramic Pellets
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SITE Chapelcross
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Magnox Limited
WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	4.0 m ³
Total future arisings:		0 m ³
Total waste volume:		4.0 m ³
Comment on volumes:	There will be no further arisings. The four reactors at Chapelcross ceased generating in the period from August 2001 (R1) to February 2004 (R2).	
Uncertainty factors on volumes:	Stock (upper): x 1.2	Arisings (upper) x
	Stock (lower): x 0.8	Arisings (lower) x

WASTE SOURCE Irradiated ceramic pellet waste from post reactor operations.

PHYSICAL CHARACTERISTICS

General description: The waste consists of irradiated ceramic pellet waste. The pellets are whole or fragmented. They are stored in '304 type' stainless steel cans, which forms part of the waste stream.

Physical components (%wt): Ceramic pellets (69%) SS Can (31%).

Sealed sources: -

Bulk density (t/m³): 1.3

Comment on density: The mean density of 1.3t/m³ refers to the mass of the components divided by the volume as stored.

CHEMICAL COMPOSITION

General description and components (%wt): Ceramic pellets (69%) SS Can (31%).

Chemical state: Neutral

Chemical form of radionuclides: H-3: Not assessed
C-14: Not assessed
Cl-36: Not assessed
Se-79: Not present.
Tc-99: Not present.
Ra: Not assessed
Th: Not assessed
U: Not assessed
Np: Not present.
Pu: Not assessed

Metals and alloys (%wt): -

Stainless steel.....	~31.0
Other ferrous metals.....	0
Iron.....	
Aluminium.....	0
Beryllium.....	0
Cobalt.....	
Copper.....	0
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	
Titanium.....	

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	Uranium.....		
	Zinc.....	0	
	Zircaloy/Zirconium.....	0	
	Other metals.....	0	
Organics (%wt):	No organic materials are present in the waste.		
	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....	0	
	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.....	0	
Other materials (%wt):	-		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs.....	0	
	Soil.....	0	
	Brick/Stone/Rubble.....	0	
	Cementitious material.....	0	
	Sand.....		
	Glass/Ceramics.....	69.0	ceramic pellets
	Graphite.....	0	
	Desiccants/Catalysts.....		
	Asbestos.....	0	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....	0	
Inorganic anions (%wt):	Some inorganic anions will be present.		

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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:

No materials likely to pose a fire or other non-radiological hazard have been identified.

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.....	
Soluble solids as bulk chemical compounds.....	

Hazardous substances / non hazardous pollutants:

Toxic metals are unlikely to be present.

Acrylamide.....	
Benzene.....	
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	
Styrene.....	
Tri-butyl phosphate.....	
Other organophosphates.....	
Vinyl chloride.....	
Arsenic.....	
Barium.....	
Boron.....	

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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 to be stored in the ILW store for at least 80 years in 500 litre drums. Disposal as ILW is the baseline assumption but it is possible that after this time it will have decayed to LLW and be disposed of at the LLWR.

Plant Name: -
 Location: Chapelcross
 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
	500 l drum	100.0	0.2	0.47	20

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Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: Not specified

Other information: -

Conditioned density (t/m³): 1.3

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing:

Treatment	Stream volume (%)	Comment
-	-	-

RADIOACTIVITY

Source: The material is contaminated, mainly with tritium.

Uncertainty: The activity values are based on sampling, and the accuracy is about 50%.

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: The activity values are based on sampling.

Other information: -

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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	1.81E+02	AA 1			Gd 153			8	
Be 10		8			Ho 163			8	
C 14		6			Ho 166m			8	
Na 22					Tm 170			8	
Al 26					Tm 171			8	
Cl 36	2E-02	AA 1			Lu 174			8	
Ar 39		8			Lu 176			8	
Ar 42		8			Hf 178n			8	
K 40		8			Hf 182			8	
Ca 41		6			Pt 193			8	
Mn 53		8			Tl 204			8	
Mn 54		8			Pb 205			8	
Fe 55		6			Pb 210			8	
Co 60	9.17E-05	AA 1			Bi 208			8	
Ni 59		8			Bi 210m			8	
Ni 63		8			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		8			Th 227			8	
Zr 93		8			Th 228			8	
Nb 91		8			Th 229			8	
Nb 92		8			Th 230			8	
Nb 93m		8			Th 232			8	
Nb 94		8			Th 234			8	
Mo 93		8			Pa 231			8	
Tc 97		8			Pa 233			8	
Tc 99		8			U 232			8	
Ru 106		8			U 233			8	
Pd 107		8			U 234			8	
Ag 108m		8			U 235			8	
Ag 110m		8			U 236			8	
Cd 109		8			U 238			8	
Cd 113m		8			Np 237			8	
Sn 119m		8			Pu 236			8	
Sn 121m		8			Pu 238			8	
Sn 123		8			Pu 239			8	
Sn 126		8			Pu 240			8	
Sb 125		8			Pu 241			8	
Sb 126		8			Pu 242			8	
Te 125m		8			Am 241			8	
Te 127m		8			Am 242m			8	
I 129		6			Am 243			8	
Cs 134	1.95E-05	AA 1			Cm 242			8	
Cs 135		8			Cm 243			8	
Cs 137		8			Cm 244			8	
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		8			Cf 250			8	
Pm 147		8			Cf 251			8	
Sm 147		8			Cf 252			8	
Sm 151		8			Other a				
Eu 152		7			Other b/g				
Eu 154		8			Total a	0		0	
Eu 155	8.33E-06	AA 1			Total b/g	1.81E+02	AA 1	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