

WASTE STREAM**9G36/C****Conditioned Miscellaneous Activated Components**

SITE Trawsfynydd
SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Conditioned	Packaged
Stocks:	At 1.4.2022.....	~46.4 m ³	52.3 m ³
Total future arisings:		0 m ³	0 m ³
Total waste volume:		46.4 m ³	52.3 m ³
Number of waste packages in stock:	At 1.4.2022.....	16 package(s)	

Comment on volumes: All of this waste stream has now been conditioned.

Uncertainty factors on volumes:
 Stock (upper): x 1.0 Arisings (upper) x
 Stock (lower): x 1.0 Arisings (lower) x

WASTE SOURCE Redundant or defective components removed from the reactor core.

PHYSICAL CHARACTERISTICS

General description: The waste comprises miscellaneous activated components, principally absorber bars, held in mild steel baskets and encapsulated in PFA/OPC and packaged in 3m³ stainless steel boxes. The waste is conditioned and packaged.

Physical components (%wt): Steel components constitute approximately 65% wt, reactor grade A graphite constitutes approximately 5% wt and PFA/OPC grout about 30% wt.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~3.5

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Steel components constitute approximately 65% wt, reactor grade A graphite constitutes approximately 5% wt and PFA/OPC grout about 30% wt.

Chemical state: Alkali

Chemical form of radionuclides: H-3: The chemical form of tritium has not been determined but may be present as water or as other inorganic or organic compounds.

C-14: Carbon 14 will be present as graphite.

Cl-36: The chemical form of chlorine 36 has not been determined.

Se-79: The selenium content is insignificant.

Tc-99: The technetium content is insignificant.

Ra: The radium isotope content is insignificant.

Th: The thorium isotope content is insignificant.

U: The uranium isotope content is insignificant.

Np: The neptunium content is insignificant.

Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): Contains flux flattening bars 855 mm x 70 mm diameter containing graphite and steel pellets approximately 25 mm x 25 mm diameter. Flux flattening bars comprise the bulk of the waste.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	~65.0	Carbon steel is present. reactor grade A	
Iron.....			

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Aluminium.....	NE	
Beryllium.....	NE	
Cobalt.....		
Copper.....	NE	
Lead.....	NE	
Magnox/Magnesium.....	0	
Nickel.....		
Titanium.....		
Uranium.....		
Zinc.....	NE	
Zircaloy/Zirconium.....	NE	
Other metals.....	NE	"Other" metals are not assessed.

Organics (%wt): Only trace quantities present, if any. There are no halogenated plastics or rubbers present.

	(%wt)	Type(s) and comment	% of total C14 activity
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....	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.....	TR		

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	30.0	PFA/OPC grout	
Sand.....			

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Glass/Ceramics.....	0
Graphite.....	~5.0
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): Not fully assessed. There will be aluminates and silicates associated with the grout.

	(%wt)	Type(s) and comment
Fluoride.....	NE	
Chloride.....	NE	
Iodide.....	NE	
Cyanide.....	0	
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.

	(%wt)	Type(s) and comment
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.....		
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

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Hazardous substances / none expected
 non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		
Other organophosphates.....		
Vinyl chloride.....		
Arsenic.....		
Barium.....		
Boron.....	0	
Boron (in Boral).....		
Boron (non-Boral).....		
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

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....		
Total complexing agents.....	0	

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Potential for the waste to contain discrete items:

Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs; Stainless items assumed DIs (MAC also includes nimonics, known DIs)

PACKAGING AND CONDITIONING

Container type:

Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
3m ³ box (round corners)	100.0	2.9	2.9	16

Container type comment:

The waste has been conditioned.

Range in container waste volume:

There is no significant variability in the volume of waste per container

Other information on containers:

The container material is stainless steel.

Conditioned density (t/m³):

~3.5

Conditioned density comment:

-

Other information on conditioning:

The waste was conditioned in 2001 to 2003.

RADIOACTIVITY

Source:

Irradiated components removed from the reactor.

Uncertainty:

The values quoted were derived from radionuclide fingerprints which are considered to be accurate to a factor of 4.

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:

Estimates are based upon theoretical assessments supported by measurements.

Other information:

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	1.42E-02	BB 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14		8			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	9.31E-06	BB 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	8.81E-02	BB 2			Pb 210		8		
Co 60	1.92E-01	BB 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	5.14E-01	BB 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		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		8			Am 243		8		
Cs 134		8			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		8			Other b/g				
Eu 154		8			Total a	0			0
Eu 155		8			Total b/g	8.08E-01	BB 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