

WASTE STREAM	9C24	FED Magnox (lugs and splitters)
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SITE Dungeness A
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Magnox Limited
WASTE TYPE ILW
 Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	1.0 m ³
Total future arisings:		0 m ³
Total waste volume:		1.0 m ³
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.2 Stock (lower): x 0.8	Arisings (upper) x Arisings (lower) x

WASTE SOURCE FED found inside fuel skips in R1 & R2 ponds. The waste consists of Magnox metal, swarf and sludge which may be contaminated by fission products and actinides. Components may weigh up to about 10g and be approximately 4 mm x 15 mm x 100 mm. There are no large items in the waste which will require special handling.

PHYSICAL CHARACTERISTICS

General description: FED Magnox
 Physical components (%vol): Magnox (mainly AL 80 and MN 80), magnesium hydroxide and magnesium carbonate will be present (>99.9% wt).
 Sealed sources: The waste does not contain sealed sources.
 Bulk density (t/m³): 0.65
 Comment on density: The bulk density of 0.65 t/m³ taken from an average of measured values in NNL Analysis report EX09284/06/10/04 and NNL Analysis report EX09284/06/10/03 for samples taken from R1 and R2 ponds.

CHEMICAL COMPOSITION

General description and components (%wt): Magnox metal, magnesium carbonate and magnesium hydroxide. Activation of trace components within the Magnox (>99% wt in total including impurities). Fission product and actinide contamination.
 Chemical state: -
 Chemical form of radionuclides: H-3: The tritium is expected to be present as surface contamination, possibly as water, but perhaps in the form of other inorganic or organic compounds.
 C-14: The carbon-14 will probably be present as graphite.
 Tc-99: The chemical form of technetium has not been determined.
 Ra: Chemical form of Uranium isotopes has not been determined but may be oxides.
 Np: The chemical form of neptunium has not been determined.
 Pu: Chemical form of plutonium isotopes has not been determined but may be oxides.
 Metals and alloys (%wt): The waste is predominantly lugs, which will be typically 4 mm by 15 mm by 100 mm.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....			
Other ferrous metals.....			
Iron.....	TR		
Aluminium.....			
Beryllium.....	TR		
Cobalt.....			
Copper.....			

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Lead.....		
Magnox/Magnesium.....	>99.0	AL 80 and MN 80 alloys, which have 0.8 wt% aluminium and manganese respectively. Impurities may include beryllium.
Nickel.....		
Titanium.....		
Uranium.....		
Zinc.....	TR	
Zircaloy/Zirconium.....		
Other metals.....		

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	0		
Paper, cotton.....			
Wood.....			
Halogenated plastics			
Total non-halogenated plastics.....	0		
Condensation polymers.....			
Others.....			
Organic ion exchange materials....			
Total rubber.....	0		
Halogenated rubber			
Non-halogenated rubber.....			
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....			

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..			
Inorganic sludges and flocs.....			
Soil.....			
Brick/Stone/Rubble.....			
Cementitious material.....			
Sand.....			
Glass/Ceramics.....			
Graphite.....	TR		
Desiccants/Catalysts.....			

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Asbestos.....
 Non/low friable.....
 Moderately friable.....
 Highly friable.....
 Free aqueous liquids.....
 Free non-aqueous liquids.....
 Powder/Ash.....

Inorganic anions (%wt): -

(%wt) Type(s) and comment

Fluoride.....
 Chloride.....
 Iodide.....
 Cyanide.....
 Carbonate.....
 Nitrate.....
 Nitrite.....
 Phosphate.....
 Sulphate.....
 Sulphide.....

Materials of interest for waste acceptance criteria: -

(%wt) Type(s) and comment

Combustible metals..... >99.0
 Low flash point liquids.....
 Explosive materials.....
 Phosphorus.....
 Hydrides.....
 Biological etc. materials.....
 Biodegradable materials.....
 Putrescible wastes.....
 Non-putrescible wastes.....
 Corrosive materials.....
 Pyrophoric materials.....
 Generating toxic gases.....
 Reacting with water..... >99.0
 Higher activity particles.....
 Soluble solids as bulk chemical compounds.....

Hazardous substances / non hazardous pollutants: -

(%wt) Type(s) and comment

Acrylamide.....

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

(%wt) Type(s) and comment

EDTA.....
 DPTA.....
 NTA.....
 Polycarboxylic acids.....
 Other organic complexants.....
 Total complexing agents.....

Potential for the waste to contain discrete items:

No. In & of itself not a DI; Likely to contain "rogue" items (HDRIs) that will be (see Nimonic/Others)

PACKAGING AND CONDITIONING

Conditioning method:

To be placed into DCIC and dried as necessary, due to small volume likely to be co-disposed of with other MCI such as 9C38, 9C40, 9C41 or 9C43.

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Plant Name: -
 Location: -
 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 to be co-disposed of with other MCI such as 9C38, 9C40, 9C41 or 9C43. As such no containers allocated to this stream.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages

Likely container type comment: -
 Range in container waste volume: -
 Other information on containers: -
 Likely conditioning matrix:
 Other information: -
 Conditioned density (t/m³): -
 Conditioned density comment: -
 Other information on conditioning: -
 Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

RADIOACTIVITY

Source: -
 Uncertainty: The source of the waste is the removal of lugs from fuel elements prior to dispatch of the elements to Sellafield. Activation of trace nuclides in the Magnox and contamination by fission products and actinides will be main sources of activity.
 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 values quoted are derived from samples taken and analysed in NNL Analysis report EX09284/06/10/04 and NNL Analysis report EX09284/06/10/03. Summarised in M/EF/DNA/EAN/0002/19 (table 1)
 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	3.69E-03	CC 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	4.00E-05	CC 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	2.29E-07	CC 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	3.38E-05	CC 2			Pb 210		8		
Co 60	1.08E-04	CC 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	7.98E-04	CC 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	2.53E-04	CC 2			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	5.25E-08	8		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	2.07E-07	CC 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	6.71E-08	CC 2		
Ag 108m	5.08E-06	CC 2			U 235	3.63E-09	CC 2		
Ag 110m		8			U 236	3.64E-09	CC 2		
Cd 109		8			U 238	5.25E-08	CC 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	1.10E-04	CC 2		
Sn 123		8			Pu 239	1.00E-04	CC 2		
Sn 126		8			Pu 240	1.00E-04	CC 2		
Sb 125	1.05E-06	CC 2			Pu 241	4.20E-03	CC 2		
Sb 126		8			Pu 242		8		
Te 125m	2.64E-07	8			Am 241	4.53E-04	CC 2		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134	6.87E-07	CC 2			Cm 242	2.54E-08	CC 2		
Cs 135		8			Cm 243	1.33E-05	CC 2		
Cs 137	8.19E-04	CC 2			Cm 244	1.28E-05	CC 2		
Ba 133	1.40E-06	CC 2			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	7.71E-06	CC 2			Other b/g		CC 2		
Eu 154	1.16E-04	CC 2			Total a	7.89E-04	CC 2	0	
Eu 155	2.87E-05	CC 2			Total b/g	1.01E-02	CC 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