WASTE STREAM	9G34/C	FED Magnox

SITE Trawsfynydd

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m^3)	OR	Conditioned (m^3)	Packaged (m^3)
Stocks:	At 1.4.2025		= 162.4	183.3
Future arisings:				0.0
Total future arisings:				0.0
Total waste volume:			**0.0**	**0.0**
			162.4	**183.3**

Number of waste packages in stock: At 1.4.2025…… 56 packages

Comment on arising rates: -

Additional information on quantities: -

Uncertainty factors on volumes:
Stock (upper): x 1.00 Arisings (upper): x -
Stock (lower): x 1.00 Arisings (lower): x -

WASTE SOURCE The source of the waste is the removal of splitters from fuel elements prior to dispatch of the elements to Sellafield.

PHYSICAL CHARACTERISTICS

General description: The waste mainly consists of Magnox metal which may be contaminated by fission products and actinides. The waste is conditioned and packaged in 3m3 stainless steel boxes.

Changes since waste generated: -

Bulk density (t/m^3): = 2.3

Comment on density: The density of 2.29 Te/m3 is calculated using the known wasteform masses and the wasteform volumes.

CHEMICAL COMPOSITION

General description and components (%wt): Grout (84.7% wt), Magnox ZR55 (11.5% wt), Magnox MN80 (3.52% wt), Zircaloy (0.12% wt), Nimonic 80A (0.19% wt) and other materials (~1% wt).

Chemical state: Alkali

Sheet metal proportion / thickness: There are no bulk metal items present in this waste stream.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel……	= 0.06	Weak link brace	
Other ferrous metals……	< 0.01	Mild steel (fuel pot).	
Iron……		-	
Aluminium……	= 0	-	
Beryllium……	TR	-	
Cobalt……		-	
Copper……	= 0	-	
Lead……	= 0	-	
Magnox/Magnesium……	= 15.0	11.47 wt% Magnox alloy ZR55, which contains 0.55 wt% Zr as an alloying constituent from splitters/braces. 3.518 wt% Magnox alloy MN80 from top end fittings.	
Nickel……	= 0.19	Nimonic 80A (spring).	
Titanium……		-	
Uranium……	< 0.01	Fuel	
Zinc……		-	
Zircaloy/Zirconium……	= 0.12	Zircaloy from top end fitting inserts (pin).	
Other metals……	0	-	

Organics (%wt):

	(%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	= 84.7	Grout (9:1 BFS/OPC)	
Sand		-	
Glass/Ceramics	= 0	-	
Graphite	TR	-	
Desiccants/Catalysts		-	
Asbestos	= 0	-	
Non/low friable		-	
Moderately friable		-	
Highly friable		-	
Free aqueous liquids	= 0	-	
Free non-aqueous liquids	= 0	-	
Powder/Ash	TR	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride	TR	-
Chloride	TR	-
Iodide	= 0	-
Cyanide	= 0	-
Carbonate	TR	-
Nitrate	TR	-
Nitrite	TR	-
Phosphate	TR	-
Sulphate	TR	-
Sulphide	= 0	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals	= 15.0	-
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	= 15.0	-
Higher activity particles		-
Soluble solids as bulk chemical compounds		-

Hazardous substances / 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		-

Complexing agents (%wt): Yes

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

Physical components:

	Number	Type(s) and comment
Sources		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1		-
EEE Type 2		-
EEE Type 3		-
EEE Type 4		-
EEE Type 5		-

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off-site	Stream volume %
Size reduction		
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment		
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments: -

Conditioning method: The waste has already been conditioned. Waste is combined with Nimonic stream 9G40, retrieved, packaged and encapsulated in 3m3 boxes. The waste is sorted to ensure package dose rates do not exceed specified on-site handling limits. The waste has already been conditioned. The waste has been encapsulated in BFS/OPC. The packaged waste includes FED Nimonic waste stream 9G40.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix: -

Further information on the conditioning matrix: The encapsulation matrix will be 9:1 BFS/OPC.

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
3 m^3 box (side lifting)	100.0	2.9	2.9	56	-

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

Other information on packaging and conditioning: Waste streams 9G34 and 9G40 will be processed as a single waste for disposal as ILW. Nimonic springs are distributed throughout the waste.

Conditioned density (t/m^3): = 2.3
Conditioned density comment: The conditioned density is calculated using the known waste package mass and package volume.

Management Routes:

Disposal Route	Stream volume %	Raw density t/m^3	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)			
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility	100.0		
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility:

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: The source of the waste is the removal of splitters 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.

Uncertainty: The values quoted are indicative of the activities that might be expected.

Measurement of radioactivities: Values are from the inventory of the South Magnox Vault Packages 1-13 and the wastestream volume.

Chemical form of radionuclides:

H-3: 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: -
Cl-36: Chlorine 36 incorporated in the Magnox may be associated with barium impurity (barium chloride), other chlorine 36 may be associated with surface contamination.
Se-79: The selenium content is insignificant.
Tc-99: The chemical form of technetium has not been determined.
I-129: -
Ra: Radium isotope content is not significant.
Th: The thorium isotope content is insignificant.
U: Chemical form of uranium isotopes has not been determined but may be uranium oxides.
Np: The chemical form of neptunium has not been determined.
Pu: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

WASTE STREAM **9G34/C** **FED Magnox**

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	4.55E-03	C C 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	1.62E-04	C C 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1.72E-06	C C 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	4.57E-06	C C 2			Pb 210		8		
Co 60	8.76E-03	C C 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	5.63E-01	C C 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	7.93E-08	C C 2			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	5.67E-03	C C 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	1.83E-06	C C 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233	6.03E-09	C C 2		
Tc 99	2.41E-06	C C 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	2.39E-06	C C 2		
Ag 108m	2.94E-06	C C 2			U 235	6.90E-08	C C 2		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	1.83E-06	C C 2		
Cd 113m		8			Np 237	6.08E-09	C C 2		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	4.01E-04	C C 2		
Sn 123		8			Pu 239	2.96E-04	C C 2		
Sn 126		8			Pu 240	3.79E-04	C C 2		
Sb 125	3.48E-08	C C 2			Pu 241	2.46E-03	C C 2		
Sb 126		8			Pu 242		8		
Te 125m	8.71E-09	C C 2			Am 241	1.36E-03	C C 2		
Te 127m		8			Am 242m		8		
I 129	7.59E-09	C C 2			Am 243		8		
Cs 134	1.76E-08	C C 2			Cm 242		8		
Cs 135		8			Cm 243	1.05E-06	C C 2		
Cs 137	6.50E-03	C C 2			Cm 244	1.37E-05	C C 2		
Ba 133	1.10E-06	C C 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	1.87E-06	C C 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Unsp a				
Eu 152	3.53E-06	C C 2			Unsp b/g				
Eu 154	1.12E-05	C C 2			**Total a**	**2.45E-03**	*	**0**	*
Eu 155	5.12E-07	C C 2			**Total b/g**	**5.91E-01**	*	**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 the 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
* Total calculated from the 114 declared radionuclides