WASTE STREAM	9B83/C	Graphite Filter Dust Pots

SITE Bradwell

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		= 1.7	9.2
Future arisings:				0.0
				0.0
Total future arisings:			**0.0**	**0.0**
Total waste volume:			**1.7**	**9.2**

Number of waste packages in stock: At 1.4.2025…… 7 packages

Comment on arising rates: -

Additional information on quantities: volume calculated based on each package being 55% full

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

WASTE SOURCE

The waste was produced in the by-pass filters, located on the reactor gas circuits. The graphite dust (and rust fragments) in the gas circuit were deposited into the by-pass filter catch pots, which were in-turn decanted into plastic bags within the interim storage filter dust pots, which were constructed from 8 inch nominal bore carbon steel pipe fittings. Sand arose from filter units in the Pond Water Treatment Plant (PWTP) - formerly known as 9B65.

PHYSICAL CHARACTERISTICS

General description: Graphite dust originates from the by-pass filter units, where graphite dust was removed from the reactor primary gas circuits. The dust also contains fragments of rust from the reactor pressure vessel internals. This was co-packaged with sand from filter units in the Pond Water Treatment Plant (PWTP) into 7 MOSAIKs.

Changes since waste generated: -

Bulk density (t/m^3): = 2.0

Comment on density: Density is based on known waste mass for each package and voidage calculations to obtain the volume for each waste package.

CHEMICAL COMPOSITION

General description and components (%wt): Graphite dust (23 wt%), contained in carbon steel fabricated interim storage pots (15 wt%) and plastic drums (1 wt%), and sand (61 wt%) co-packaged in 7 MOSAIKs.

Chemical state: -

Sheet metal proportion / thickness: Carbon steel fabricated interim storage graphite filter dust pots (15.41wt%).

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel……	0	-	
Other ferrous metals……	= 15.4	carbon steel fabricated interim storage pots	
Iron……		-	
Aluminium……	0	-	
Beryllium……		-	
Cobalt……		-	
Copper……	0	-	
Lead……	0	-	
Magnox/Magnesium……	0	-	
Nickel……		-	
Titanium……		-	
Uranium……		-	
Zinc……	0	-	
Zircaloy/Zirconium……	0	-	
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	= 1.0	-	
Condensation polymers	0	-	
Others	= 1.0	Plastic drums	
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):

	(%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	0	-	
Sand	= 60.9	Contaminated sand originating from waste stream 9B65.	
Glass/Ceramics	0	-	
Graphite	= 22.7	Graphite dust stored in filter pots.	
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	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:

	(%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		-

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): No

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

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: Waste has been co packaged with 9B65 Conditioning by heated vacuum drying at 50 mbar for a minimum of 8 days.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix: -

Further information on the conditioning matrix: -

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
500 l RS drum (0mm Pb)	100.0	0.24	0.24	7	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m^3): 2.0
Conditioned density comment: Based upon voidage calculations and known waste mass.

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: Contamination by graphite from primary circuit and the filtering of active material from pond water using sand filters.

Uncertainty: Specific activity is a function of operating history. Activities given are based on the graphite dust (without accounting for the mass of the carbon steel pot). Specific activities of all 7 waste packages were determined using gamma spectroscopy and fingerprints. The values quoted are based on 2012 and 2013 characterisation data, scaled to Co-60 content of each waste package and summed to output waste stream total. Decayed to 01/04/2025.

Measurement of radioactivities: Specific activities of all 7 waste packages were measured and derived using gamma spectroscopy and the application of fingerprints.

Chemical form of radionuclides:

H-3: -
C-14: -
Cl-36: -
Se-79: -
Tc-99: -
I-129: -
Ra: -
Th: -
U: -
Np: -
Pu: -

WASTE STREAM **9B83/C** **Graphite Filter Dust Pots**

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	1.45E-03	C C 2			Gd 153		8		
Be 10	3.66E-09	C C 2			Ho 163	2.41E-06	C C 2		
C 14	3.97E-03	C C 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1.84E-04	C C 2			Lu 174		8		
Ar 39	2.35E-06	C C 2			Lu 176	4.06E-06	C C 2		
Ar 42		8			Hf 178n		8		
K 40	3.52E-08	C C 2			Hf 182	8.84E-04	C C 2		
Ca 41	2.09E-04	C C 2			Pt 193	1.23E-06	C C 2		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	1.26E-03	C C 2			Pb 210	1.02E-03	C C 2		
Co 60	4.85E-03	C C 2			Bi 208		8		
Ni 59	1.45E-04	C C 2			Bi 210m		8		
Ni 63	9.99E-03	C C 2			Po 210	9.84E-04	C C 2		
Zn 65		8			Ra 223		8		
Se 79	8.14E-09	C C 2			Ra 225		8		
Kr 81	1.69E-08	C C 2			Ra 226	3.08E-03	C C 2		
Kr 85	1.34E-04	C C 2			Ra 228	1.32E-07	C C 2		
Rb 87		8			Ac 227		8		
Sr 90	5.13E-04	C C 2			Th 227		8		
Zr 93	1.81E-06	C C 2			Th 228	2.11E-07	C C 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	4.38E-06	C C 2			Th 232		8		
Nb 94	7.01E-06	C C 2			Th 234	1.53E-08	C C 2		
Mo 93	9.14E-06	C C 2			Pa 231		8		
Tc 97		8			Pa 233	5.64E-08	C C 2		
Tc 99	1.38E-04	C C 2			U 232	2.30E-08	C C 2		
Ru 106		8			U 233		8		
Pd 107	1.99E-08	C C 2			U 234	1.86E-09	C C 2		
Ag 108m	1.05E-03	C C 2			U 235	4.10E-09	C C 2		
Ag 110m		8			U 236	5.23E-07	C C 2		
Cd 109		8			U 238	1.53E-08	C C 2		
Cd 113m	5.28E-07	C C 2			Np 237	5.64E-08	C C 2		
Sn 119m		8			Pu 236	2.90E-08	C C 2		
Sn 121m	5.36E-06	C C 2			Pu 238	3.79E-05	C C 2		
Sn 123		8			Pu 239		8		
Sn 126	7.39E-08	C C 2			Pu 240	7.15E-05	C C 2		
Sb 125	3.91E-08	C C 2			Pu 241	6.28E-05	C C 2		
Sb 126	1.04E-08	C C 2			Pu 242	1.16E-04	C C 2		
Te 125m	9.80E-09	C C 2			Am 241	1.90E-06	C C 2		
Te 127m		8			Am 242m	4.77E-04	C C 2		
I 129	1.42E-05	C C 2			Am 243	1.91E-07	C C 2		
Cs 134	7.96E-07	C C 2			Cm 242	3.94E-04	C C 2		
Cs 135	1.49E-07	C C 2			Cm 243	3.83E-07	C C 2		
Cs 137	1.05E-02	C C 2			Cm 244	4.44E-06	C C 2		
Ba 133	5.87E-05	C C 2			Cm 245		8		
La 137	4.28E-08	C C 2			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145	5.53E-09	C C 2			Cf 250		8		
Pm 147	1.27E-07	C C 2			Cf 251		8		
Sm 147	4.67E-04	C C 2			Cf 252		8		
Sm 151	5.39E-05	C C 2			Unsp a				
Eu 152	3.91E-05	C C 2			Unsp b/g	8.83E-04			
Eu 154	1.23E-04	C C 2			**Total a**	**5.16E-03**	*	**0**	*
Eu 155		8			**Total b/g**	**3.80E-02**	*	**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