WASTE STREAM 9R101 Berkeley Centre Decommissioning : Primary ILW

SITE	Berkeley
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.....	0 m^3
Future arisings -	1.4.2022 - 31.3.2023.....	18.9 m^3
Total future arisings:		18.9 m^3
Total waste volume:		18.9 m^3

Comment on volumes: Decommissioning of active facilities commenced in 2005.

Uncertainty factors on volumes:

Stock (upper):	x	Arisings (upper)	x 1.2
Stock (lower):	x	Arisings (lower)	x 0.8

WASTE SOURCE Materials that have been used in the examination of irradiated fuel, steel and graphite.

PHYSICAL CHARACTERISTICS

General description:	A variety of mild steel, stainless steel, lead and other materials mostly laboratory constructional materials and equipment. Includes some secondary waste. Waste can be packaged in standard ILW packages.
Physical components (%vol):	67% General Scrap, 14% General Waste, 10% Steel, 4% Plastics, 2% Stainless Steel, 3% Other.
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m^3):	~1.5
Comment on density:	The average bulk density is estimated at ~1.5 t/m3.

CHEMICAL COMPOSITION

General description and components (%wt):	A variety of mild steels, stainless steels, lead and other materials. Percentage breakdown has not been assessed.
Chemical state:	Neutral
Chemical form of radionuclides:	H-3: The chemical form of tritium has not been assessed. C-14: The chemical form of carbon 14 has not been assessed. Cl-36: The chemical form of chlorine 36 has not been assessed. Ra: The radium isotopes content is expected to be insignificant. Th: The thorium isotopes content is expected to be insignificant. U: The chemical form of uranium isotopes has not been assessed. Pu: The chemical form of plutonium isotopes has not been assessed.
Metals and alloys (%wt):	Proportions of bulk metal items have not been assessed. Some items may be cut for packaging.

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

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Magnox/Magnesium	TR	
Nickel	TR	Nimonic
Titanium		
Uranium		
Zinc	NE	
Zircaloy/Zirconium	NE	
Other metals	NE	Not fully assessed.

Organics (%wt): Some organic materials may be present.

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

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			
Glass/Ceramics	NE		
Graphite	NE		
Desiccants/Catalysts			
Asbestos	0		
Non/low friable			

Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	0
Free non-aqueous liquids.....	0
Powder/Ash.....	TR

Inorganic anions (%wt): Not assessed.

	(%wt)	Type(s) and comment
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.

	(%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: Some lead is expected, other toxic metal contents have not been fully assessed.

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		

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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): Yes

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

Potential for the waste to contain discrete items: Not yet determined. In & of itself not a DI; waste stream may include DIs (notably any stainless steel components)

PACKAGING AND CONDITIONING

Conditioning method: To be co-packaged with 9R02, 9R10, 9R13, 9R17, 9R19, 9R112, 9R118. Packages are assigned to 9R02 & 9R101.

Plant Name: -

Location: -

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Plant startup date: -

Total capacity (m^3/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m^3/y incoming waste): -

Other information: -

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages
3m^3 RS box	100.0	~3.15	2.5	6

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix:

Other information: -

Conditioned density (t/m^3): -

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: Contamination of the materials.

Uncertainty: Estimates have been made from waste disposed during previous cave line refurbishment.

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: From health physics returns of LLW packages sent for disposal.

Other information: There will be contamination by fission products and activation products.

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3			2.02E-04	C C 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			2E-05	C C 2	Ho 166m				8
Na 22					Tm 170				8
Al 26					Tm 171				8
Cl 36			5E-05	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				6	Pt 193				8
Mn 53				8	Tl 204				8
Mn 54				8	Pb 205				8
Fe 55			5.05E-05	C C 2	Pb 210				8
Co 60			7.98E-05	C C 2	Bi 208				8
Ni 59				6	Bi 210m				8
Ni 63			5.72E-04	C C 2	Po 210				8
Zn 65				8	Ra 223				8
Se 79				6	Ra 225				8
Kr 81				8	Ra 226				8
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90			1.69E-02	C C 2	Th 227				8
Zr 93				6	Th 228				8
Nb 91				8	Th 229				8
Nb 92				8	Th 230				8
Nb 93m				6	Th 232				8
Nb 94				6	Th 234			1E-07	C C 2
Mo 93				6	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99				6	U 232				8
Ru 106			8.12E-08	C C 2	U 233				8
Pd 107				6	U 234			4.06E-07	C C 2
Ag 108m			9.88E-06	C C 2	U 235			7E-09	C C 2
Ag 110m				8	U 236			8E-08	C C 2
Cd 109				8	U 238			1E-07	C C 2
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				6
Sn 121m				6	Pu 238			2.84E-04	C C 2
Sn 123				8	Pu 239			7E-05	C C 2
Sn 126				6	Pu 240			1E-04	C C 2
Sb 125			1.03E-05	C C 2	Pu 241			5.00E-03	C C 2
Sb 126				8	Pu 242				6
Te 125m			2.57E-06	C C 2	Am 241			3.63E-04	C C 2
Te 127m				8	Am 242m				6
I 129			4E-09	C C 2	Am 243				8
Cs 134			9.54E-06	C C 2	Cm 242				8
Cs 135				6	Cm 243			1.71E-06	C C 2
Cs 137			7.66E-03	C C 2	Cm 244			6.12E-05	C C 2
Ba 133			4.42E-06	C C 2	Cm 245				6
La 137				8	Cm 246				6
La 138				8	Cm 248				8
Ce 144			1.59E-09	C C 2	Cf 249				8
Pm 145				8	Cf 250				8
Pm 147			9.45E-05	C C 2	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151				8	Other a				
Eu 152				6	Other b/g			5.94E-09	C C 2
Eu 154			1.14E-04	C C 2	**Total a**	**0**		**8.81E-04**	**C C 2**
Eu 155			1.86E-05	C C 2	**Total b/g**	**0**		**3.08E-02**	**C C 2**

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