

WASTE STREAM	9A38	Miscellaneous Contaminated Items
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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.....	10.9 m ³
Total future arisings:		0 m ³
Total waste volume:		10.9 m ³
Comment on volumes:	Station operation ceased in March 1989. The last accumulation of waste in this stream was in 1992. There will be no further arisings of this waste stream.	
Uncertainty factors on volumes:	Stock (upper): x 1.1	Arisings (upper) x
	Stock (lower): x 0.9	Arisings (lower) x

WASTE SOURCE Redundant contaminated and activated materials and equipment from reactor and pond areas.

PHYSICAL CHARACTERISTICS

General description: The waste consists of miscellaneous contaminated items from the operation of the Berkeley Power Station. The waste is predominantly items of redundant or scrap equipment made of mild steel, including trailing lead thermocouples, actuator wires, defective gags and Syntox blocks. There are also 13 steel baskets from Bradwell Power Station which, although they are classed as Berkeley Technology Centre MCI, will be processed as Berkeley Power Station MCI. The smaller items of waste are in a variety of steel drum and cans, whilst the larger items are loose in the vault and may have been wrapped in polythene or coated with 'Detex' to contain contamination. The waste containers are included in this waste stream. Some of the loose items will be large and may need to be size reduced.

Physical components (%wt): Items made of mild steel (~95% wt), polythene (<1% wt) and other miscellaneous materials (~4% wt).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~0.34

Comment on density: Calculated from total mass and volume of this waste.

CHEMICAL COMPOSITION

General description and components (%wt): The waste is expected to be principally mild steel (~95% wt). There will be polythene (<1% wt) and miscellaneous materials (~4% wt).

Chemical state: Neutral

Chemical form of radionuclides:
H-3: Tritium may be present as water, in the form of other inorganic compounds or organic compounds, or as tritium gas incorporated in metal.
C-14: Chemical form of carbon 14 has not been determined but may be graphite.
Cl-36: The chemical form of chlorine 36 in these wastes is not known.
Se-79: The chemical form of selenium-79 has not been determined.
Tc-99: The chemical form of technetium-99 has not been determined.
Ra: .The chemical form of radium isotopes have not been determined.
Th: The chemical form of thorium isotopes have not been determined.
U: Chemical form of uranium isotopes has not been determined but may be uranium oxides.
Np: The chemical form of neptunium isotopes have not been determined.
Pu: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): The metal will be of varying thickness (~1mm to 50mm thick). There is no further information on the metals in the waste.

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	~95.0		
Iron.....			
Aluminium.....	0		
Beryllium.....	0		
Cobalt.....			
Copper.....	0		
Lead.....	0		
Magnox/Magnesium.....	0		
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....	0		
Zircaloy/Zirconium.....	0		
Other metals.....	NE	"Other" metals will include unidentified thermocouple materials.	

Organics (%wt): Polythene wrapping material will be present and there may be trace quantities of rubber and oil. Cellulosic materials are expected only in trace quantities, if any. Latex (Detex) coating on some items.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	TR		
Paper, cotton.....	TR		
Wood.....	0		
Halogenated plastics	0		
Total non-halogenated plastics.....	<1.0		
Condensation polymers.....	0		
Others.....	<1.0		
Organic ion exchange materials....	0		
Total rubber.....	TR		
Halogenated rubber	TR		
Non-halogenated rubber.....	NE		
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	TR		

Other materials (%wt): Traces of graphite may be present.

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	(%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.....	0		
Graphite.....	TR		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	TR		
Powder/Ash.....	0		

Inorganic anions (%wt): There may be traces of anions associated with the wastes.

	(%wt)	Type(s) and comment
Fluoride.....	0	
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: There are no identified materials likely to represent a fire or other non-radiological hazard.

	(%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.....		

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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 / 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.....		

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Complexing agents (%wt): Yes

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....	TR	Organic complexing agents may be present in trace quantities.
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: This stream is to be co-packaged with 9A36, 9A37, 9A57, 9A58, 9A59, 9A65, 9A68, 9A69, 9A70, 9A71, 9A72, 9A75, 9A77, 9A78, 9A82. Packages are assigned to 9A68, 9A71 & 9A75.

Plant Name: -
 Location: Berkeley Site
 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 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: -

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

Source:	The radioactivity may have arisen both from activation and contamination while the material was used in the reactor area or pond area.
Uncertainty:	The values quoted are indicative of the activities that may be expected.
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 specific activities were derived by estimation based upon available information.
Other information:	Specific activity is a function of Station operating history. Specific activities were derived by estimation based upon available information. The caesium 137 activity will probably determine when this waste becomes LLW.

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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	1.29E-03	CC 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	9.99E-06	CC 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	7E-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	1.97E-05	CC 2			Pb 210		8		
Co 60	6.95E-05	CC 2			Bi 208		8		
Ni 59	1E-06	CC 2			Bi 210m		8		
Ni 63	8.10E-05	CC 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	1.21E-08	CC 2			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	4.89E-03	CC 2			Th 227		8		
Zr 93	6E-07	CC 2			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	3.85E-07	CC 2			Th 232		8		
Nb 94		8			Th 234	3E-07	CC 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233	4.16E-08	CC 2		
Tc 99	3E-06	CC 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	3.09E-07	CC 2		
Ag 108m	<2.94E-06	C 3			U 235	7E-09	CC 2		
Ag 110m		8			U 236	4.00E-08	CC 2		
Cd 109		8			U 238	3E-07	CC 2		
Cd 113m		8			Np 237	4.16E-08	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	1.78E-04	CC 2		
Sn 123		8			Pu 239	1.00E-04	CC 2		
Sn 126	4.35E-08	CC 2			Pu 240	2.00E-04	CC 2		
Sb 125		8			Pu 241	1.46E-03	CC 2		
Sb 126	6.09E-09	CC 2			Pu 242	1E-07	CC 2		
Te 125m		8			Am 241	3.44E-04	CC 2		
Te 127m		8			Am 242m	8.36E-07	CC 2		
I 129	6E-09	CC 2			Am 243	3.00E-07	CC 2		
Cs 134	2.60E-08	CC 2			Cm 242	6.90E-07	CC 2		
Cs 135	1E-07	CC 2			Cm 243	2.13E-07	CC 2		
Cs 137	4.95E-03	CC 2			Cm 244	1.69E-06	CC 2		
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	9.46E-07	CC 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	2.66E-05	CC 2			Other a				
Eu 152	1.39E-07	CC 2			Other b/g				
Eu 154	1.50E-05	CC 2			Total a	8.25E-04	CC 2	0	
Eu 155	8.35E-07	CC 2			Total b/g	1.28E-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