

WASTE STREAM	9A37	Miscellaneous Contaminated Items
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SITE Berkeley

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

WASTE VOLUMES

	Reported
Stocks: At 1.4.2019.....	0.2 m ³
Total future arisings:	0 m ³
Total waste volume:	0.2 m ³

Comment on volumes: Station operation ceased in March 1989. The last accumulation of waste in this stream was in 1979. 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 from maintenance work.

PHYSICAL CHARACTERISTICS

General description: The waste comprises miscellaneous items from the Berkeley Power Station including grinding, vacuum and cyclone dusts, along with ball end fittings and actuator wires. These wastes are contained in 2 thick walled sludge drums and a number of mild steel thin walled cans. There is also a metal strip from a Syntox block and a bob weight, which is loose in the vault. The waste containers are included in this waste stream. There are no large items to influence treatment or disposal.

Physical components (%vol): The waste includes dusts (grinding, vacuum and cyclone), steel actuator wires and the mild steel cans and drums which contain the waste. Approximately 95% other ferrous metals and 5% other metals.

Sealed sources: -

Bulk density (t/m³): ~0.46

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 and dusts. Other components have not been assessed.

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): Much of the metal will be the sheet metal (thickness ~ 1 mm) of the mild steel cans containing the waste. Other metals will be small metal items (thicknesses to 10 mm) or dusts.

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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.....	~5.0

The waste is composed principally of carbon steel.

"Other" metals have not been assessed but are expected to comprise about 5% of the waste stream.

Organics (%wt):

There may be traces of oil.	
Total cellulose.....	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):

Traces of graphite may be present.

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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..... P

Inorganic anions (%wt):

Inorganic anion content is expected to be negligible.
 Fluoride..... 0
 Chloride..... 0
 Iodide..... 0
 Cyanide..... 0
 Carbonate..... 0
 Nitrate..... 0
 Nitrite..... 0
 Phosphate..... 0
 Sulphate..... 0
 Sulphide..... 0

Materials of interest for waste acceptance criteria:

There are no identified materials likely to represent a fire or other non-radiological hazard.

Combustible metals..... 0
 Low flash point liquids..... 0
 Explosive materials..... 0
 Phosphorus..... 0
 Hydrides..... 0
 Biological etc. materials..... 0
 Biodegradable materials.....
 Putrescible wastes..... 0
 Non-putrescible wastes.....
 Corrosive materials..... 0
 Pyrophoric materials..... 0
 Generating toxic gases..... 0
 Reacting with water..... 0
 Active particles.....

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Hazardous substances /
non hazardous pollutants:

Soluble solids as bulk chemical
compounds.....

None expected.

- Acrylamide.....
- Benzene.....
- Chlorinated solvents.....
- Formaldehyde.....
- Organometallics.....
- Phenol.....
- Styrene.....
- Tri-butyl phosphate.....
- Other organophosphates.....
- Vinyl chloride.....
- Arsenic.....
- Barium.....
- Boron.....
- 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
- EDTA.....
 - DPTA.....
 - NTA.....
 - Polycarboxylic acids.....
 - Other organic complexants..... TR
 - Total complexing agents..... TR

Organic complexing agents may
be present in trace quantities.

PACKAGING AND CONDITIONING

Conditioning method: This stream is to be co-packaged with 9A36, 9A38, 9A57, 9A58, 9A59, 9A65, 9A68, 9A69, 9A70, 9A71, 9A72, 9A75, 9A77, 9A78, 9A82. Packages are assigned to

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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:

Treatment	Stream volume (%)	Comment
-	-	-

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 expected activities.

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: Specific activities were derived by estimation based upon available information.

Other information: Specific activity is a function of Station operating history. 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 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	1.02E-03	CC 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	1.00E-05	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	9.40E-06	CC 2			Pb 210		8		
Co 60	6.18E-05	CC 2			Bi 208		8		
Ni 59	1E-06	CC 2			Bi 210m		8		
Ni 63	8.27E-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	5.26E-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	3.57E-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	4.12E-08	CC 2		
Tc 99	3E-06	CC 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	3.08E-07	CC 2		
Ag 108m	<2.96E-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	4.12E-08	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	1.82E-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	1.69E-03	CC 2		
Sb 126	6.09E-09	CC 2			Pu 242	1E-07	CC 2		
Te 125m		8			Am 241	3.38E-04	CC 2		
Te 127m		8			Am 242m	8.48E-07	CC 2		
I 129	6E-09	CC 2			Am 243	3.00E-07	CC 2		
Cs 134	1.78E-09	CC 2			Cm 242	7E-07	CC 2		
Cs 135	1E-07	CC 2			Cm 243	1.51E-07	CC 2		
Cs 137	5.30E-03	CC 2			Cm 244	1.89E-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	3.77E-07	CC 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	2.73E-05	CC 2			Other a				
Eu 152	1.62E-07	CC 2			Other b/g				
Eu 154	1.14E-05	CC 2			Total a	8.24E-04	CC 2	0	
Eu 155	9.18E-07	CC 2			Total b/g	1.35E-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