

<b>WASTE STREAM</b>	<b>9C950</b>	<b>Redundant Sealed Sources</b>
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**SITE** Dungeness A  
**SITE OWNER** Nuclear Decommissioning Authority  
**WASTE CUSTODIAN** Magnox Limited  
**WASTE TYPE** LLW

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	< 0.1 m <sup>3</sup>
Future arisings -	1.4.2024 - 31.3.2025.....	< 0.1 m <sup>3</sup>
Total future arisings:		< 0.1 m <sup>3</sup>
Total waste volume:		< 0.1 m <sup>3</sup>

Comment on volumes: The period of Care and Maintenance Preparation is expected to be complete in March 2025. A small number of sources maybe disposed of prior to 2024. Common volume assumption of 0.0002m<sup>3</sup> per source (10cm x 10cm x 2cm) has been applied. Data from site source register shows 104 sources in stock and 104 forecast future arisings.

Uncertainty factors on volumes: Stock (upper): x 1.2 Arisings (upper) x 1.2  
 Stock (lower): x 0.8 Arisings (lower) x 0.8

**WASTE SOURCE** Redundant sealed sources used for a variety of purposes around the power station site.

**PHYSICAL CHARACTERISTICS**

General description: Various redundant sealed sources.  
 Physical components (%wt): Plastic (60%), Paper (30%), Metal (10%).  
 Sealed sources: The waste contains sealed sources. 208  
 Bulk density (t/m<sup>3</sup>): ~1  
 Comment on density: Density refers to sources on bases only, when they have been stripped of all extraneous materials, which are disposed of as non-active material. Redundant sources will then be encapsulated for disposal as LLW.

**CHEMICAL COMPOSITION**

General description and components (%wt): Plastic bases for sources are mainly PVC. Metal bases mainly Stainless Steel. Plastic (60%), Paper (30%), Metal (10%).  
 Chemical state: Neutral  
 Chemical form of radionuclides: Ra: The chemical form of radium has not determined.  
 U: The chemical form of uranium has not been determined.  
 Metals and alloys (%wt): -

Stainless steel.....	10.0
Other ferrous metals.....	0
Iron.....	
Aluminium.....	0
Beryllium.....	
Cobalt.....	
Copper.....	0
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	
Titanium.....	
Uranium.....	
Zinc.....	0
Zircaloy/Zirconium.....	0

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	Other metals.....	0	
Organics (%wt):	-		
	Total cellulose.....	30.0	
	Paper, cotton.....	30.0	
	Wood.....	0	
	Halogenated plastics .....	60.0	Mainly PVC
	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.....	0	
Other materials (%wt):	-		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs.....	0	
	Soil.....	0	
	Brick/Stone/Rubble.....	0	
	Cementitious material.....	0	
	Sand.....		
	Glass/Ceramics.....	0	
	Graphite.....	0	
	Desiccants/Catalysts.....		
	Asbestos.....	0	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....	0	
Inorganic anions (%wt):	-		

**WASTE STREAM****9C950 Redundant Sealed Sources**

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.

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.....	
Soluble solids as bulk chemical compounds.....	

Hazardous substances /  
non hazardous pollutants:

Only very small quantities of lead are expected.

Acrylamide.....	
Benzene.....	
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	
Styrene.....	
Tri-butyl phosphate.....	
Other organophosphates.....	
Vinyl chloride.....	
Arsenic.....	
Barium.....	
Boron.....	

**WASTE STREAM****9C950 Redundant Sealed Sources**

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):

No  
 EDTA.....  
 DPTA.....  
 NTA.....  
 Polycarboxylic acids.....  
 Other organic complexants.....  
 Total complexing agents..... 0

**TREATMENT, PACKAGING AND DISPOSAL**

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

Treatment	On-site / Off site	Stream volume %
Low force compaction Supercompaction (HFC) Incineration Solidification Decontamination Metal treatment Size reduction Decay storage Recycling / reuse Other / various None		100.0

Comment on planned treatments:

Sources will be stripped of all extraneous material and encapsulated in grout in "paint-tin" type containers.

**WASTE STREAM****9C950****Redundant Sealed Sources****Disposal Routes:**

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known	100.0

**Upcoming (2019/20-2021/22) Waste Routing (if expected to change from above):**

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known			

**Waste Packaging for Disposal:**

Container	Stream volume %	Waste loading m <sup>3</sup>	Number of packages
1/3 Height IP-1 ISO 2/3 Height IP-2 ISO 1/2 Height WAMAC IP-2 ISO 1/2 Height IP-2 Disposal/Re-usable ISO 2m box (no shielding) 4m box (no shielding) Other	100.0	15.5	< 1

**Other information:**

Only one paint-tin type container is allowed per disposal container for sealed sources. It is expected that this stream will be disposed with other LLW streams. Waste will not be drummed and supercompacted but encapsulated into 100ml grout.

**Waste Planned for Disposal at the LLW Repository:****Container voidage:**

No significant inaccessible voidage is expected.

**Waste Characterisation Form (WCH):**

The waste meets the LLWR's Waste Acceptance Criteria (WAC).  
The waste does not have a current WCH.

**Waste consigned for disposal to LLWR in year of generation:**

The timing of the waste's consignment for disposal cannot be determined at present.

**Potential for the waste to contain discrete items:**

-

**Non-Containerised Waste for In-Vault Grouting:** (Not applicable to this waste stream)**Stream volume (%):**

-

**Waste stream variation:**

-

**Bounding cuboidal volume:****Inaccessible voidage:**

-

**WASTE STREAM****9C950****Redundant Sealed Sources**

Other information:

-

**RADIOACTIVITY**

Source:

Redundant sealed sources used for a variety of purposes around the power station site.

Uncertainty:

Data taken from site source register and decayed to common stock reference date/start date of first arising

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:

-

Other information:

-

**WASTE STREAM**

**9C950**

**Redundant Sealed Sources**

Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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	1.95E-04	BB 2	2.31E-04	BB 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	7.3E-06	BB 2	1.96E-04	BB 2	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36	6.76E-05	BB 2	6.73E-06	BB 2	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	7.17E-05	BB 2	9.17E-08	BB 2	Pb 210		8		8
Co 60		8	2.14E-05	BB 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	9.14E-04	BB 2	2.46E+00	BB 2	Po 210		8		8
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226	1.25E-05	BB 2	2.57E+00	BB 2
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	9.34E-03	BB 2	1.78E-02	BB 2	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94		8		8	Th 234		8		8
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234		8		8
Ag 108m		8		8	U 235		8		8
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238		8		8
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238		8		8
Sn 123		8		8	Pu 239		8		8
Sn 126		8		8	Pu 240		8		8
Sb 125		8		8	Pu 241	6.97E-05	BB 2		8
Sb 126		8		8	Pu 242		8		8
Te 125m		8		8	Am 241	4.35E-04	BB 2	4.29E-01	BB 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134		8		8	Cm 242		8		8
Cs 135		8		8	Cm 243		8		8
Cs 137	5.36E-04	BB 2	5.29E+00	BB 2	Cm 244		8		8
Ba 133		8	1.04E-03	BB 2	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147		8		8	Cf 251		8		8
Sm 147		8		8	Cf 252		8	1.32E-06	BB 2
Sm 151		8		8	Other a				
Eu 152	8.89E-04	BB 2		8	Other b/g				
Eu 154		8		8	<b>Total a</b>	<b>4.48E-04</b>		<b>3.00E+00</b>	<b>CC 2</b>
Eu 155		8		8	<b>Total b/g</b>	<b>1.21E-02</b>		<b>7.77E+00</b>	<b>CC 2</b>

**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