

<b>WASTE STREAM</b>	<b>9D82</b>	<b>Vacuum Debris (ILW)</b>
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**SITE** Hinkley Point A  
**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.....	1.7 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		1.7 m <sup>3</sup>
Comment on volumes:	No future arisings are expected.	
Uncertainty factors on volumes:	Stock (upper): x 1.1	Arisings (upper) x
	Stock (lower): x 0.9	Arisings (lower) x

**WASTE SOURCE** The waste is redundant equipment and material usually arising from irradiated fuel handling and pond operations.

**PHYSICAL CHARACTERISTICS**

General description: Redundant equipment and material. Vacuum debris, 7 drums, total volume = 1.7m<sup>3</sup>  
 Physical components (%vol): Organics (~78% wt), steel drums (~18% wt), cellulose (soft organic drum liners) (~2% wt), plastics/rubber (liners) (~2% wt), free non-aqueous liquids (TR) and complexing agents (TR).  
 Sealed sources: The waste does not contain sealed sources.  
 Bulk density (t/m<sup>3</sup>): ~0.275  
 Comment on density: Density provided by site following creation of materials based new streams from the parent 9D30 stream. Density adjusted to produce waste stream weight as per change form HPA 223

**CHEMICAL COMPOSITION**

General description and components (%wt): Vacuum debris, 7 drums, total volume = 1.7m<sup>3</sup>  
 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.  
 Se-79: The chemical form of selenium has not been determined.  
 Tc-99: The chemical form of technetium has not been determined.  
 Ra: Radium isotope content is insignificant.  
 Th: The thorium isotope content is insignificant.  
 U: The chemical form of uranium isotopes has not been assessed but may be uranium oxides.  
 Np: The chemical form of neptunium has not been determined.  
 Pu: The chemical form of plutonium isotopes has not been assessed but may be plutonium oxides.  
 Metals and alloys (%wt): Steel coffins, drums and desplitting machine parts are present as bulk metal items. Dimensions have not been fully assessed.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	18.0	Carbon and low alloy steels may be present (BS 55304, 316 and 321).	
Iron.....			
Aluminium.....	NE		

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Beryllium.....	NE	
Cobalt.....		
Copper.....	NE	
Lead.....	NE	
Magnox/Magnesium.....	NE	
Nickel.....		
Titanium.....		
Uranium.....		
Zinc.....	NE	
Zircaloy/Zirconium.....	NE	
Other metals.....	NE	Not fully assessed.

Organics (%wt):                      The cellulosic content is expected to be present in very small quantities as wrapping material. There may be traces of oil and grease. The presence of halogenated plastics and rubbers has not been fully assessed.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	~2.0		
Paper, cotton.....	~2.0	soft organic drum liners	
Wood.....	NE		
Halogenated plastics .....	~1.0	liners	
Total non-halogenated plastics.....	NE		
Condensation polymers.....	NE		
Others.....	NE		
Organic ion exchange materials....	NE		
Total rubber.....	~1.0		
Halogenated rubber .....	NE		
Non-halogenated rubber.....	~1.0	liners	
Hydrocarbons.....			
Oil or grease .....			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	~78.0		

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.....	NE		
Cementitious material.....	0		
Sand.....			

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Glass/Ceramics.....	0
Graphite.....	NE
Desiccants/Catalysts.....	
Asbestos.....	NE
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	0
Free non-aqueous liquids.....	TR
Powder/Ash.....	P

Inorganic anions (%wt):           Not fully assessed.

	(%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:           Not fully assessed, traces of Magnox may be present.

	(%wt)	Type(s) and comment
Combustible metals.....	NE	
Low flash point liquids.....	NE	
Explosive materials.....	NE	
Phosphorus.....	NE	
Hydrides.....	NE	
Biological etc. materials.....	NE	
Biodegradable materials.....	0	
Putrescible wastes.....	NE	
Non-putrescible wastes.....		
Corrosive materials.....	NE	
Pyrophoric materials.....	NE	
Generating toxic gases.....	NE	
Reacting with water.....	NE	
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

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Hazardous substances / Not fully assessed.  
 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.....		

Complexing agents (%wt):      Yes

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

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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: Gravel and particulate conditioning plant (PCF or tumble mix TBC)  
 Plant Name: -  
 Location: -  
 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 (m³)	Payload (m³)	Number of packages
	6m³ concrete box (SD)	100.0	~1.7	5.8	1

Likely container type comment: -  
 Range in container waste volume: -  
 Other information on containers: -  
 Likely conditioning matrix: Not specified  
 Other information: -  
 Conditioned density (t/m³): -  
 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: The radioactivity has arisen both from activation and contamination while the materials were used in reactor or pond areas.  
 Uncertainty: The values quoted are notional, representing an indicative Total Activity scaled to the 9D75 LLW Vacuum Debris fingerprint.  
 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'.

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Measurement of  
radioactivities:

As per HINA/WASTE/76 (PROG/HPA/SILW/0069) this update was derived by scaling  
extant notional estimates of Total Activity to the 9D75 Vacuum Debris LLW Fingerprint.

Other information:

Specific activity is a function of Station operating history.

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**9D82**

**Vacuum Debris (ILW)**

Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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	3.61E-04	DD 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	1.23E-04	DD 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1.64E-04	DD 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	5.59E-05	DD 2			Pb 210		8		
Co 60	3.87E-04	DD 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	1.81E-03	DD 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79		8			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	6.53E-05	DD 2			Th 227		8		
Zr 93		8			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m		8			Th 232		8		
Nb 94		8			Th 234		8		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99		8			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234		8		
Ag 108m		8			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238		8		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	3.42E-06	DD 2		
Sn 123		8			Pu 239	2.69E-06	DD 2		
Sn 126		8			Pu 240	4.47E-06	DD 2		
Sb 125		8			Pu 241	9.6E-05	DD 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	1.62E-05	DD 2		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134	2.39E-07	DD 2			Cm 242		8		
Cs 135		8			Cm 243		8		
Cs 137	1.49E-04	DD 2			Cm 244		8		
Ba 133	1.21E-06	DD 2			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	3.67E-07	DD 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152		8			Other b/g				
Eu 154	2.21E-06	DD 2			<b>Total a</b>	<b>2.68E-05</b>	<b>DD 2</b>		<b>0</b>
Eu 155	3.81E-07	DD 2			<b>Total b/g</b>	<b>3.21E-03</b>	<b>DD 2</b>		<b>0</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