

<b>WASTE STREAM</b>	<b>9C37</b>	<b>DNA Resin Secondary Waste</b>
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**SITE** Dungeness A  
**SITE OWNER** Nuclear Decommissioning Authority  
**WASTE CUSTODIAN** Magnox Limited  
**WASTE TYPE** LLW  
 Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	7.7 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		7.7 m <sup>3</sup>
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.1	Arisings (upper) x
	Stock (lower): x 0.9	Arisings (lower) x

**WASTE SOURCE** A campaign of resin retrieval and conditioning of Dungeness A ion exchange resin is underway, from Settling Tanks 3 and 4 (ST3 and ST4). The resin itself is ILW. The process is creating a variety of secondary waste.

**PHYSICAL CHARACTERISTICS**

General description: This includes soft waste (gloves, swabs, Taki wipes/de-rad wipes, polythene, sizalcraft, Wypalls, etc) that will span the duration of the resin retrieval campaign; hoses, HEPA filters, and at the end of the project, the main transfer hoses and lances, and the tank arrangements (break tank, batch tank). Other contaminated items may be encountered such as tooling, or small pieces of equipment (torque wrenchs, spanners, thermocouples, blanking plugs, pumps, etc). Some of these items may have some oil or grease present.

Physical components (%wt): Metal (28%), Biodegradable non-putrescibles (7%), Plastics (non-halogenated) (57%), Rubber (7%) and other (1%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): 0.43

Comment on density: Derived from WCH mass divided by volume.

**CHEMICAL COMPOSITION**

General description and components (%wt): Metal (28%), Biodegradable non-putrescibles (7%), Plastics (non-halogenated) (57%), Rubber (7%) and other (1%).

Chemical state: Neutral

Chemical form of radionuclides: -

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	7.0	Standard Grade: 316 (385 kg break tank, 331 kg hand tools e.g. torque wrenches, spanners, etc, pumps, hose connectors/fittings, HEPA filter cases, suction lances, thermocouples, blanking plugs, 592.1g TC14 (unshielded) drums used for disposal to incineration site)	
Other ferrous metals.....	21.4	Standard Grade: S275JR (3500 kg batch tank, 400 kg wheels from cross site transport, 100 kg miscellaneous hand tools e.g. torque wrenches, spanners, etc).	
Iron.....			

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Aluminium.....  
 Beryllium.....  
 Cobalt.....  
 Copper.....  
 Lead.....  
 Magnox/Magnesium.....  
 Nickel.....  
 Titanium.....  
 Uranium.....  
 Zinc.....  
 Zircaloy/Zirconium.....  
 Other metals.....

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	0		
Paper, cotton.....			
Wood.....			
Halogenated plastics .....			
Total non-halogenated plastics.....	57.3	0.32 tonnes of hoses, plus 80% of soft waste estimated to be plastic (10.42 tonnes of 13.02 tonnes soft waste).	
Condensation polymers.....	57.3	0.32 tonnes of hoses, plus 80% of soft waste estimated to be plastic (10.42 tonnes of 13.02 tonnes soft waste).	
Others.....	0		
Organic ion exchange materials....	<0.01	Lewatit and Duolite IX resins solid resin beads or fines present as contamination on other material.	
Total rubber.....	7.0		
Halogenated rubber .....	3.5		
Non-halogenated rubber.....	3.5		
Hydrocarbons.....			
Oil or grease .....	<0.01	Present on tools/pumps.	
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....			

Other materials (%wt): -

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	(%wt)	Type(s) and comment		% of total C14 activity
Inorganic ion exchange materials..				
Inorganic sludges and flocs.....				
Soil.....				
Brick/Stone/Rubble.....				
Cementitious material.....				
Sand.....				
Glass/Ceramics.....				
Graphite.....				
Desiccants/Catalysts.....				
Asbestos.....	0			
Non/low friable.....				
Moderately friable.....				
Highly friable.....				
Free aqueous liquids.....				
Free non-aqueous liquids.....				
Powder/Ash.....				
Inorganic anions (%wt):	-			

	(%wt)	Type(s) and comment		
Fluoride.....				
Chloride.....				
Iodide.....				
Cyanide.....				
Carbonate.....				
Nitrate.....				
Nitrite.....				
Phosphate.....				
Sulphate.....				
Sulphide.....				
Materials of interest for waste acceptance criteria:	-			

	(%wt)	Type(s) and comment		
Combustible metals.....				
Low flash point liquids.....				
Explosive materials.....				
Phosphorus.....				
Hydrides.....				
Biological etc. materials.....				
Biodegradable materials.....	7.0			
Putrescible wastes.....				
Non-putrescible wastes.....	7.0			

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Corrosive materials.....  
 Pyrophoric materials.....  
 Generating toxic gases.....  
 Reacting with water.....  
 Higher activity particles.....  
 Soluble solids as bulk chemical  
 compounds.....

Hazardous substances /  
 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.....	<0.01	
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....		
Total complexing agents.....	<0.01	

Potential for the waste to contain discrete items:      No. In & of itself not a DI; waste stream may include DIs as defined elsewhere (notably any stainless steel components)

**TREATMENT, PACKAGING AND DISPOSAL**

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

Treatment	On-site / Off site	Stream volume %
Low force compaction	Off-site	81.7
Supercompaction (HFC)		
Incineration		
Solidification	Off-site	7.5
Decontamination		
Metal treatment		
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		10.8

Comment on planned treatments:      None = 10.8% expected to be consigned to LLWR.

**Disposal Routes:**

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	10.8	0.43
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	81.7	0.40
Expected to be consigned to a Metal Treatment Facility	7.5	1.4
Expected to be consigned as Out of Scope		
Expected to be recycled / reused		
Disposal route not known		

Classification codes for waste expected to be consigned to a landfill facility:      -

**Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):**

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
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			

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Opportunities for alternative disposal routing: -

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

**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	10.8	10	< 1

Other information: -

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

Container voidage: -

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC).  
The waste has a current WCH.  
Inventory information is consistent with the current WCH.

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

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

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

**RADIOACTIVITY**

Source: -

Uncertainty: -

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: Data taken from WCH ref: 1MXN-3DUA-0-WCH-0-4686 V6 decayed two years for RWI 2022.

Other information: -

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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		8			Gd 153		8		
Be 10		8			Ho 163		8		
C 14		8			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1.12E-09	CC 1			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		8			Pb 210		8		
Co 60		8			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	1.84E-08	CC 1			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	2.98E-06	CC 1			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	3.72E-09	CC 2			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	4.90E-09	CC 1		
Sn 123		8			Pu 239	3.73E-09	CC 1		
Sn 126		8			Pu 240	3.73E-09	CC 1		
Sb 125	1.51E-09	CC 2			Pu 241	1.80E-07	CC 1		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	1.30E-08	CC 1		
Te 127m		8			Am 242m		8		
I 129	2.49E-09	CC 1			Am 243		8		
Cs 134	3.94E-08	CC 2			Cm 242		8		
Cs 135		8			Cm 243		8		
Cs 137	6.79E-05	CC 2			Cm 244		8		
Ba 133	3.27E-09	CC 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		8			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	2.45E-09	CC 1			Other a				
Eu 152	8.98E-09	CC 2			Other b/g				
Eu 154	2.12E-09	CC 2			<b>Total a</b>	<b>2.53E-08</b>	<b>CC 1</b>	<b>0</b>	
Eu 155	1.41E-08	CC 2			<b>Total b/g</b>	<b>7.12E-05</b>	<b>CC 1</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