

WASTE STREAM	9C912	Effluent Treatment Plant, Ponds and Decontamination LLW
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SITE Dungeness A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 6.4		
Future arisings:	1.4.2025 - 31.3.2030	= 317.5		
Total future arisings:		317.5		
Total waste volume:		323.9		

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: -

Additional information on quantities: Waste volumes take no account of volume reduction by supercompaction.

Uncertainty factors on volumes:

Stock (upper):	x 1.20	Arisings (upper):	x 1.20
Stock (lower):	x 0.80	Arisings (lower):	x 0.80

WASTE SOURCE

9C912 is a large area legacy operational fingerprint under which waste generated through decommissioning of the plants and systems associated with the wet fuel storage ponds, active effluent treatment plant, flask handling, washdown and storage areas are consigned. This waste stream covers wastes generated from decommissioning activities from the following areas:

- Pond Area (PA)
- Flask Washdown (FW)
- Active Effluent Water Treatment Plant (AEWTP)
- Plant Water Filtration Caesium Removal Plant (PWFCR)
- Lug Vault (LG)
- Active Workshop (AW)
- DAMAL Labs (DM)

PHYSICAL CHARACTERISTICS

General description: The types of waste associated with this waste stream include decommissioned plant and equipment, structural materials, scaffolding tubes, plasterboard, asbestos, concrete/rubble, soils, lead shot/shielding and secondary wastes such as damaged PPE, wood, coveralls, enclosure sheeting, other plastics and rubber. Other items are likely to be generated as the decommissioning continues including asbestos gaskets, asbestos lagging and ponds waste (with potential traces of sodium carbonate and sodium hydroxide liquid). Other wastes have also been identified and include HEPA filters and vacuum cleaner bags which are generated across the waste stream areas.

Plant systems and items in this area have been identified to be subject to similar radiological activation and contamination processes and conditions. Activation products, fission products and actinide contamination are anticipated in this low level waste (LLW) decommissioning waste stream. All sources of radiological contamination are considered to be in a decaying state.

Changes since waste generated: -

Bulk density (t/m³): ~ 0.76

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Decommissioned plant and equipment, structural materials, scaffolding tubes, plasterboard, asbestos, concrete/rubble, soils, lead shot/shielding and secondary wastes such as damaged PPE, wood, coveralls, enclosure sheeting, other plastics and rubber. Percentage breakdown by weight is metal waste (~75%wt), plastics (~7%wt), rubble/concrete (~1%wt), rubber (~2%wt), wood (~8%wt), soil (~1%wt), biodegradable putrescibles (~3%wt), biodegradable non-putrescibles (1%), other organic (~1%wt), and other (~1%wt).

Chemical state: Neutral

Sheet metal proportion / thickness: Metal thickness may vary from ~1mm to ~30mm.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 18.8	Drums, sweepings, cabling, pipework	
Other ferrous metals.....	~ 50.1	Mild steel - Drums, sweepings, cabling, HEPA filters, emergency fuel chutes, pipework	
Iron.....	~ 0.16	Legacy plant items	
Aluminium.....	~ 1.4	Sweepings, cabling, HEPA filters, ponds metallic equipment, pipework, scaffolding	
Beryllium.....	-	-	
Cobalt.....	-	-	
Copper.....	~ 5.8	Cabling, pumps	
Lead.....	-	-	
Magnox/Magnesium.....	-	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	< 0.07	Trace from galvanised steel (predominantly as a coating component for scaffold tubes and casings for specific models of air filter)	
Zircaloy/Zirconium.....	-	-	
Other metals.....	-	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	8.0	-	
Paper, cotton.....	-	-	
Wood.....	= 8.0	-	
Halogenated plastics.....	= 2.1	PPE, soft waste, general waste, gaskets	
Total non-halogenated plastics.....	~ 5.1	PPE, soft waste, general waste, gaskets	
Condensation polymers.....	~ 5.1	-	
Others.....	-	-	
Organic ion exchange materials.....	-	-	
Total rubber.....	= 2.0	From rubber boots and gloves and overshoes (soles). The waste may also contain halogenated rubber as neoprene	
Halogenated rubber.....	= 1.0	-	
Non-halogenated rubber.....	= 1.0	-	
Hydrocarbons.....	-	-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	= 1.0	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	-	-	
Inorganic sludges and flocs.....	-	-	
Soil.....	= 1.0	-	
Brick/Stone/Rubble.....	= 1.0	Concrete/rubble	
Cementitious material.....	-	-	
Sand.....	-	-	
Glass/Ceramics.....	= 0.16	Man made mineral fibre lagging / fibre glass	
Graphite.....	-	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	~ 0.23	Lagging and CAF joints -chrysotile (white).	
Non/low friable.....	~ 0.08	chrysotile (white).	
Moderately friable.....	~ 0.12	chrysotile (white).	
Highly friable.....	~ 0.03	chrysotile (white).	
Free aqueous liquids.....	-	-	
Free non-aqueous liquids.....	-	-	
Powder/Ash.....	= 1.0	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

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.....	~ 4.0	-
Putrescible wastes.....	~ 3.0	-
Non-putrescible wastes.....	~ 1.0	-
Corrosive materials.....	-	-
Pyrophoric materials.....	-	-
Generating toxic gases.....	-	-
Reacting with water.....	P	200.89m2
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.....	< 4.0	Others includes wastes outside of the above categories

Complexing agents (%wt):

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

Physical components:

	Number	Type(s) and comment
Sources.....	-	-
Electronic & Electrical Equipment (EEE)	-	-
EEE Type 1.....	P	-
EEE Type 2.....	P	-
EEE Type 3.....	P	-
EEE Type 4.....	-	-
EEE Type 5.....	-	-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction		
Decay storage		
Low force compaction	On-site	= 4.0
Supercompaction (HFC)	Off-site	= 4.0
Incineration	Off-site	= 40.5
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	= 18.0
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		= 37.5

Comments on planned treatments:

35% disposal as VLLW to landfill and 2.5% direct disposal to LLWR.

Conditioning method:

-

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

Further information on the conditioning matrix:

-

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
1/2 Height WAMAC IP-2 ISO (TC08)	4.0	43.2	18.8	1	-
1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	2.5	10.0	18.3	1	-

Range in container waste loading: -

Other information on packaging and conditioning:

-

Conditioned density (t/m³):

-

Conditioned density comment:

-

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)			
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository	= 6.5	0.76	
Expected to be consigned to a Landfill Facility	= 35.0	0.76	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 40.5	0.40	
Expected to be consigned to a Metal Treatment Facility	= 18.0	1.4	
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

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

17 04 05, 17 05 03*, 17 05 04, 17 06 01*, 17 02 01, 17 02 03

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: Activation and contamination of materials.

Uncertainty: Activity values are current best estimates. Specific activity is a function of Station operating history. The values quoted are indicative of the activities that would be expected.

Measurement of radioactivities: -

Chemical form of radionuclides: H-3: Tritium present in surface contamination of waste by tritiated liquor.
C-14: Carbon 14 may be present in the form of graphite dust.
Cl-36: Chlorine 36 may be present as a contaminant of graphite dust.
Se-79: -
Tc-99: -
I-129: -
Ra: -
Th: -
U: The chemical form of uranium isotopes has not been determined but may be uranium oxides.
Np: -
Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

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Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	5.04E-05	C C 1	5.04E-05	C C 1	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	2.03E-05	C C 1	2.03E-05	C C 1	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36	6.20E-06	C C 1	6.20E-06	C C 1	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	Ti 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	2.64E-06	C C 1	2.64E-06	C C 1	Pb 210		8		8
Co 60	1.89E-06	C C 2	1.89E-06	C C 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	1.35E-05	C C 1	1.35E-05	C C 1	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		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	1.18E-04	C C 1	1.18E-04	C C 1	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	6.52E-07	C C 2	6.52E-07	C C 2	Th 234	1.29E-08	C C 2	1.29E-08	C C 2
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	1.33E-08	C C 1	1.33E-08	C C 1
Ag 108m	1.62E-06	C C 2	1.62E-06	C C 2	U 235	1.19E-09	C C 1	1.19E-09	C C 1
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238	1.29E-08	C C 1	1.29E-08	C C 1
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	8.81E-06	C C 1	8.81E-06	C C 1
Sn 123		8		8	Pu 239	8.57E-06	C C 1	8.57E-06	C C 1
Sn 126		8		8	Pu 240	1.10E-05	C C 1	1.10E-05	C C 1
Sb 125	8.95E-07	C C 2	8.95E-07	C C 2	Pu 241	2.83E-04	C C 1	2.83E-04	C C 1
Sb 126		8		8	Pu 242		8		8
Te 125m	2.24E-07	C C 2	2.24E-07	C C 2	Am 241	2.95E-05	C C 1	2.95E-05	C C 1
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	2.15E-08	C C 2	2.15E-08	C C 2	Cm 242		8		8
Cs 135		8		8	Cm 243	5.17E-09	C C 1	5.17E-09	C C 1
Cs 137	8.81E-05	C C 2	8.81E-05	C C 2	Cm 244	6.41E-08	C C 1	6.41E-08	C C 1
Ba 133	1.41E-06	C C 2	1.41E-06	C C 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	9.90E-07	C C 1	9.90E-07	C C 1	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151	8.46E-07	C C 1	8.46E-07	C C 1	Unsp a				
Eu 152	2.81E-06	C C 2	2.81E-06	C C 2	Unsp b/g				
Eu 154	1.38E-05	C C 2	1.38E-05	C C 2	Total a	5.80E-05	*	5.80E-05	*
Eu 155	2.05E-06	C C 2	2.05E-06	C C 2	Total b/g	6.10E-04	*	6.10E-04	*

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 the 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
* Total calculated from the 114 declared radionuclides