

WASTE STREAM	9C324	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	= 0		
Future arisings:	1.4.2040 - 31.3.2059	159.3		
Total future arisings:		159.3		
Total waste volume:		159.3		

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

Comment on arising rates: For inventory purposes the arisings are assumed to arise at a uniform rate over 20 years.

Additional information on quantities: Waste which has been deferred from 9C912 IDW to RDC and decayed to start date of 2040. Reactor Dismantling & Site Clearance is assumed to commence in 2040 and last for 20 years.

Uncertainty factors on volumes:

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

WASTE SOURCE -

PHYSICAL CHARACTERISTICS

General description: Plastic, rubble, wood, glass, metals, resin, paper, HEPA filters, cloth, soil, scrapped plant items and drums containing the waste. Any large items will be cut to fit standard packages.

Changes since waste generated: -

Bulk density (t/m³): = 0.45

Comment on density: Density is based on the typical weight of a 200 litre drum.

CHEMICAL COMPOSITION

General description and components (%wt): The waste consists of metal , plastic, rubble, wood and glass all in the form of scrapped plant, protective sheeting, decontamination materials and filters. The filters may contain aluminium. The breakdown is metal (including the steel drum) ~25%wt, plastic ~15%wt, wood ~6%wt, glass/rubble ~47%wt and others 7% (including encapsulated ion exchange materials (~6%wt), and about 1% asbestos and some rubber)

Chemical state: Alkali

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.....	~ 5.0	Nickel and chromium present as constituents of stainless steel.	
Other ferrous metals.....	~ 20.0	-	
Iron.....	-	-	
Aluminium.....	TR	-	
Beryllium.....	NE	-	
Cobalt.....	-	-	
Copper.....	NE	-	
Lead.....	TR	-	
Magnox/Magnesium.....	TR	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	TR	-	
Zircaloy/Zirconium.....	TR	-	
Other metals.....	NE	"Other" metals have not been identified.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~ 6.0	-	
Paper, cotton.....	~ 3.0	-	
Wood.....	~ 3.0	-	
Halogenated plastics.....	~ 7.5	-	
Total non-halogenated plastics.....	~ 7.5	-	
Condensation polymers.....	~ 4.0	-	
Others.....	~ 3.5	-	
Organic ion exchange materials.....	~ 3.0	-	
Total rubber.....	< 1.0	-	
Halogenated rubber.....	< 0.50	From rubber boots and gloves and overshoes (soles). The waste may also contain neoprene.	
Non-halogenated rubber.....	< 0.50	-	
Hydrocarbons.....	-	-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	TR	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	~ 3.0	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	-	-	
Brick/Stone/Rubble.....	~ 38.0	-	
Cementitious material.....	~ 7.0	-	
Sand.....	-	-	
Glass/Ceramics.....	~ 2.0	-	
Graphite.....	P	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	< 0	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 0	-	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	NE	-
Chloride.....	NE	-
Iodide.....	TR	-
Cyanide.....	= 0	-
Carbonate.....	NE	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	NE	-
Sulphate.....	NE	-
Sulphide.....	NE	-

Materials of interest for waste acceptance criteria:

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

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	0	-
Benzene.....		-
Chlorinated solvents.....		-
Formaldehyde.....		-
Organometallics.....		-
Phenol.....		-
Styrene.....		-
Tri-butyl phosphate.....		-
Other organophosphates.....		-
Vinyl chloride.....		-
Arsenic.....		-
Barium.....		-
Boron.....		-
Boron (in Boral).....		-
Boron (non-Boral).....		-
Cadmium.....		-
Caesium.....		-
Selenium.....		-
Chromium.....		-
Molybdenum.....		-
Thallium.....		-
Tin.....		-
Vanadium.....		-
Mercury compounds.....		-
Others.....		-

Complexing agents (%wt):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
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.....		-
EEE Type 2.....		-
EEE Type 3.....		-
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	Off-site	= 12.5
Decay storage		
Low force compaction		
Supercompaction (HFC)	Off-site	= 75.0
Incineration	Off-site	= 1.5
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment		
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		= 11.0
Treatment not yet determined		
None		

Comments on planned treatments:

It is expected that 2.5% of this waste stream will be sent to landfill as VLLW.

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 IP-2 Disposal/Re-usable ISO (TC01/TC02)	21.0	10.0	18.3	4	-

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	= 21.0		2040
Expected to be consigned to a Landfill Facility	= 2.5		2040
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 75.0		2040
Expected to be consigned to a Metal Treatment Facility	= 1.5		2040
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 01 01, 17 05 03*, 17 05 04, 17 02 03, 19 09 05, 17 06 01*

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: Activation and contamination of materials. There may be some contamination by Cs137.

Uncertainty: Activity values are current best estimates. Specific activity is a function of operating history. The values are indicative of the activities that would be expected. The activities quoted are those at 34 years after reactor shutdown, i.e. in 2040.

Measurement of radioactivities: The specific activities have been estimated from the equivalent operational waste stream and appropriately decayed for RDC.

Chemical form of radionuclides:

H-3: Tritium is present as 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			2.17E-05	C C 1	Gd 153				8
Be 10				8	Ho 163				8
C 14			2.03E-05	C C 1	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			6.20E-06	C C 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	Ti 204				8
Mn 54				8	Pb 205				8
Fe 55			5.90E-08	C C 1	Pb 210				8
Co 60			2.64E-07	C C 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			1.21E-05	C C 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			8.26E-05	C C 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			6.51E-07	C C 2	Th 234			1.29E-08	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			1.37E-08	C C 1
Ag 108m			1.58E-06	C C 2	U 235			1.19E-09	C C 1
Ag 110m				8	U 236				8
Cd 109				8	U 238			1.29E-08	C C 1
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238			7.83E-06	C C 1
Sn 123				8	Pu 239			8.57E-06	C C 1
Sn 126				8	Pu 240			1.10E-05	C C 1
Sb 125			2.07E-08	C C 2	Pu 241			1.38E-04	C C 1
Sb 126				8	Pu 242				8
Te 125m			5.18E-09	8	Am 241			3.37E-05	C C 1
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134				8	Cm 242				8
Cs 135				8	Cm 243			3.65E-09	C C 1
Cs 137			6.24E-05	C C 2	Cm 244			3.61E-08	C C 1
Ba 133			5.24E-07	C C 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			1.88E-08	C C 1	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151			7.53E-07	C C 1	Unsp a				
Eu 152			1.30E-06	C C 2	Unsp b/g				
Eu 154			4.13E-06	C C 2	Total a	0	*	6.12E-05	*
Eu 155			2.39E-07	C C 2	Total b/g	0	*	3.52E-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