

WASTE STREAM	9C911	Reactor and Boiler Systems LLW
--------------	-------	--------------------------------

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	= 140.8		
Future arisings:	1.4.2025 - 31.3.2028	= 196.8		
Total future arisings:		196.8		
Total waste volume:		337.6		

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 This waste stream covers wastes generated from decommissioning activities in the reactor building and boiler houses.

PHYSICAL CHARACTERISTICS

General description: The waste will primarily consist of metal plastics, concrete/rubble, wood and asbestos. Metal waste is expected to arise from removal of cabling and galvanised steel and includes materials such as aluminium, mild steel (majority), stainless steel and zinc. Plastic waste (halogenated and non-halogenated) consists of PPE, soft waste, general waste and gaskets. Moderately friable asbestos is expected to be present in the form of asbestos filters removed from the Mobile Extraction Units (MEUs). Other materials consisting of composite material (mixed material vacuum bags), MDF, Asbestos, WEEE, fibreglass and lubricants/greases are expected to be present.

Changes since waste generated: -

Bulk density (t/m³): = 0.26

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Metal (36%), Concrete/rubble(2%), Soil (6%), Biodegradable- non putrescibles (6%), Biodegradable-putrescibles (4%), Plastics (halogenated) (5%), Plastics (non-halogenated) (11%), Rubber (5%), Wood (5%), Other organic (1%), Others (19%)

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.....	~ 4.0	Drums, legacy plant items, sweepings, cabling.	
Other ferrous metals.....	27.7	mild steel - Drums, legacy plant items, sweepings, cabling.	
Iron.....	-	-	
Aluminium.....	= 4.6	Scaffolding tubes, HEPA filters, legacy plant items, sweepings, cabling	
Beryllium.....	-	-	
Cobalt.....	-	-	
Copper.....	-	-	
Lead.....	-	-	
Magnox/Magnesium.....	-	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	~ 0.13	Trace from galvanised steel which is associated with items such as scaffold tube, cable tray and casings of some HEPA filter designs.	
Zircaloy/Zirconium.....	-	-	
Other metals.....	-	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	5.0	-	
Paper, cotton.....	-	-	
Wood.....	= 5.0	-	
Halogenated plastics.....	= 5.0	Plastic wrappings, PPE, sheeting.	
Total non-halogenated plastics.....	= 11.0	Plastic wrappings, PPE, sheeting.	
Condensation polymers.....	~ 5.5	-	
Others.....	~ 5.5	-	
Organic ion exchange materials.....	-	-	
Total rubber.....	= 5.0	-	
Halogenated rubber.....	~ 2.5	-	
Non-halogenated rubber.....	~ 2.5	-	
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.....	~ 6.0	-	
Brick/Stone/Rubble.....	~ 2.0	-	
Cementitious material.....	-	-	
Sand.....	-	-	
Glass/Ceramics.....	= 1.2	Fibreglass	
Graphite.....	-	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	~ 2.3	-	
Non/low friable.....	-	-	
Moderately friable.....	~ 2.3	Mobile extraction unit (MEU) including filters - chrysotile (white)	
Highly friable.....	-	-	
Free aqueous liquids.....	-	-	
Free non-aqueous liquids.....	-	-	
Powder/Ash.....	-	-	

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

Inorganic anions (%wt):

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

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.....	10.0	-
Putrescible wastes.....	4.0	-
Non-putrescible wastes.....	6.0	-
Corrosive materials.....	-	-
Pyrophoric materials.....	-	-
Generating toxic gases.....	-	-
Reacting with water.....	P	22.55m2 Galvanised metal may be present in the waste
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.....	~ 15.0	19% others listed in WCH, some identified in tables above so reduced to 15% here.

Complexing agents (%wt):

	(%wt)	Type(s) and comment
EDTA.....	-	-
DPTA.....	-	-
NTA.....	-	-
Polycarboxylic acids.....	-	-
Other organic complexants.....	-	-
Total complexing agents.....	= 0	-

Physical components:

	Number	Type(s) and comment
Sources.....	-	-
Electronic & Electrical Equipment (EEE)	-	-
EEE Type 1.....	P	-
EEE Type 2.....	P	-
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		
Decay storage		
Low force compaction	On-site	= 2.9
Supercompaction (HFC)	Off-site	= 2.9
Incineration	Off-site	= 35.6
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	= 3.5
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		= 58.1

Comments on planned treatments:

It is expected that 57.75% 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 WAMAC IP-2 ISO (TC08)	2.9	43.2	18.8	1	-
1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	0.3	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	= 3.2	0.26	
Expected to be consigned to a Landfill Facility	= 57.8	0.26	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 35.6	0.40	
Expected to be consigned to a Metal Treatment Facility	= 3.5	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 operating history. The values are indicative of the activities that would be expected.

Measurement of radioactivities: -

Chemical form of radionuclides: H-3: Tritium is present as surface contamination of waste by tritiated liquor.
C-14: The chemical form of Carbon 14 has not been determined but may be graphite.
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.

WASTE STREAM 9C911 Reactor and Boiler Systems LLW									
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	1.28E-06	C C 2	1.28E-06	C C 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	1.02E-08	C C 2	1.02E-08	C C 2	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36	8.98E-07	C C 2	8.98E-07	C C 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	Ti 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	1.16E-06	C C 2	1.16E-06	C C 2	Pb 210		8		8
Co 60	5.83E-07	C C 1	5.83E-07	C C 1	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	1.03E-06	C C 2	1.03E-06	C C 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		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	2.42E-07	C C 2	2.42E-07	C C 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	1.28E-08	C C 2	1.28E-08	C C 2	Th 234	1.02E-08	C C 2	1.02E-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	7.37E-09	C C 2	7.37E-09	C C 2
Ag 108m	1.55E-08	C C 2	1.55E-08	C C 2	U 235		8		8
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238	1.02E-08	C C 2	1.02E-08	C C 2
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	4.42E-09	C C 2	4.42E-09	C C 2
Sn 123		8		8	Pu 239	2.55E-09	C C 2	2.55E-09	C C 2
Sn 126		8		8	Pu 240	3.40E-09	C C 2	3.40E-09	C C 2
Sb 125		8		8	Pu 241	4.41E-07	C C 2	4.41E-07	C C 2
Sb 126		8		8	Pu 242		8		8
Te 125m		8		8	Am 241	2.52E-08	C C 2	2.52E-08	C C 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	1.24E-09	C C 2	1.24E-09	C C 2	Cm 242		8		8
Cs 135		8		8	Cm 243		8		8
Cs 137	4.58E-07	C C 1	4.58E-07	C C 1	Cm 244	6.06E-09	C C 2	6.06E-09	C C 2
Ba 133	4.66E-09	C C 2	4.66E-09	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	3.85E-09	C C 2	3.85E-09	C C 2	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151	2.34E-07	C C 2	2.34E-07	C C 2	Unsp a				
Eu 152	1.80E-08	C C 2	1.80E-08	C C 2	Unsp b/g				
Eu 154	9.58E-09	C C 2	9.58E-09	C C 2	Total a	5.92E-08	*	5.92E-08	*
Eu 155	3.50E-09	C C 2	3.50E-09	C C 2	Total b/g	6.42E-06	*	6.42E-06	*

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