

WASTE STREAM	9J63	CCP Sludge
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SITE Hunterston A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 58.7		
Future arisings:				
Total future arisings:		0.0		
Total waste volume:		58.7		

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

Comment on arising rates: -

Additional information on quantities: No further arisings are expected.

Uncertainty factors on volumes:

Stock (upper):	x 1.10	Arisings (upper):	x -
Stock (lower):	x 0.90	Arisings (lower):	x -

WASTE SOURCE Sludge arisings from the spent fuel storage pond. The stream has been expanded to include the following sludge waste streams: CCP (20m3), PWTP Sand Filter 1&2 (6.69 m3), CCP wall UHP washing (21.88 m3), Ponds Floor Dry Shavings (10.11 m3).

PHYSICAL CHARACTERISTICS

General description: Results show the waste includes high specific gravity and large particle sizes (small pieces of aggregate). In places the waste is in clay like form which can only be mobilised by the addition of water with agitation, along with hard sludge areas that have had to be broken up and size reduced via the macerator. There is also a significant amount of metallic debris.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.1

Comment on density: The density is indicative only and represents raw 'as stored' sludge.

CHEMICAL COMPOSITION

General description and components (%wt): Aluminium hydroxide, silicic acid, silica, potassium ferrous-ferro-cyanide, magnesium hydroxide and water. Proportions have not been determined.

Chemical state: Neutral

Sheet metal proportion / thickness: No sheet metal expected in this waste stream.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0	-	
Other ferrous metals.....	< 1.0	-	
Iron.....		-	
Aluminium.....		-	
Beryllium.....	0	-	
Cobalt.....		-	
Copper.....	= 0	-	
Lead.....	= 0	-	
Magnox/Magnesium.....		-	
Nickel.....		-	
Titanium.....		-	
Uranium.....		-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	TR	"Other" metals include nickel, chromium, cobalt, calcium and strontium at trace quantities.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	= 0	-	
Paper, cotton.....	= 0	-	
Wood.....	= 0	-	
Halogenated plastics.....	TR	-	
Total non-halogenated plastics.....	= 0	-	
Condensation polymers.....	= 0	-	
Others.....	= 0	-	
Organic ion exchange materials.....	TR	-	
Total rubber.....	TR	-	
Halogenated rubber.....	TR	-	
Non-halogenated rubber.....	TR	-	
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.....	= 0	-	
Inorganic sludges and flocs.....	~ 100.0	including approximately 1% aluminium hydroxide and 2% magnesium hydroxide	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....		-	
Glass/Ceramics.....	= 0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....		-	
Asbestos.....	= 0	-	
Non/low friable.....		-	
Moderately friable.....		-	
Highly friable.....		-	
Free aqueous liquids.....	P	-	
Free non-aqueous liquids.....	TR	-	
Powder/Ash.....	= 0	-	

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

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	~ 2.0	-
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.....	~ 2.0	-
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):

No		
	(%wt)	Type(s) and comment
EDTA.....	= 0	-
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 Decay storage Low force compaction Supercompaction (HFC) Incineration 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 Treatment not yet determined None	On-site	100.0

Comments on planned treatments:

-

Conditioning method:

All the waste being held in a tank is expected to be retrieved when a conditioning campaign is undertaken. Waste will be mechanically retrieved adjacent to its current location in the PPS. It will be loaded into small (approx. 130-165 L) cans for solidification in a tumble mixer machine, prior to loading into a 3m3 stainless steel box for entombment using the SILWE facility. The project expects to use 500 cans and 63 boxes.

Conditioning plants:

Plant Name	Location
HNA SILWE	Hunterston A

Likely conditioning matrix:

Unknown

Further information on the conditioning matrix:

The matrix is expected to be 9:1 BFS/OPC.

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	3 m³ box (side lifting)	100.0	0.93	2.9	63	-

Range in container waste loading: Not yet determined. No significant variability is expected.

Other information on packaging and conditioning:

The container material is expected to be stainless steel. Wet ILW recovery and encapsulation plant used to condition waste.

Conditioned density (t/m³):

~ 2.0

Conditioned density comment:

The conditioned density range is not estimated.

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)	NE		
Expected to be Non-NSD HAW managed under Scottish Government's policy	NE		
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			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
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:

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source:

The principal source of radioactivity is Cs-137, Sr-90 and Pu-241 from fuel.

Uncertainty:

The values quoted are indicative of the activities that might be expected.

Measurement of radioactivities:

-

Chemical form of radionuclides:

H-3: Tritium will be present as water.
C-14: Carbon 14 will be present as graphite.
Cl-36: The chemical form of chlorine 36 has not been determined.
Se-79: The selenium content is insignificant.
Tc-99: The technetium content is insignificant.
I-129: -
Ra: Radium isotope content is insignificant.
Th: The thorium isotope content is insignificant.
U: Uranium isotope content is insignificant.
Np: The neptunium content is insignificant.
Pu: The chemical form of plutonium isotopes has not been determined but may be present as plutonium oxides.

WASTE STREAM			9J63		CCP Sludge				
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	1.06E-04	C C 1			Gd 153		8		
Be 10	9.98E-08	C C 2			Ho 163	4.22E-08	C C 2		
C 14	4.02E-05	C C 1			Ho 166m	1.33E-05	C C 2		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1.49E-06	C C 1			Lu 174		8		
Ar 39	5.15E-05	C C 2			Lu 176		8		
Ar 42		8			Hf 178n	1.86E-05	C C 2		8
K 40	2.65E-06	C C 2			Hf 182		8		
Ca 41	1.22E-06	C C 2			Pt 193	3.42E-05	C C 2		
Mn 53		8			Tl 204	1.38E-06	C C 2		
Mn 54		8			Pb 205		8		
Fe 55	1.34E-07	C C 1			Pb 210	8.20E-06	C C 2		
Co 60	1.49E-05	C C 1			Bi 208		8		
Ni 59	5.02E-06	C C 1			Bi 210m		8		
Ni 63	2.18E-06	C C 1			Po 210	8.08E-06	C C 2		
Zn 65		8			Ra 223		8		
Se 79	6.99E-08	C C 2			Ra 225		8		
Kr 81	8.28E-07	C C 2			Ra 226	1.58E-05	C C 2		
Kr 85	5.02E-04	C C 2			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	1.33E-02	C C 1			Th 227		8		
Zr 93	2.24E-06	C C 2			Th 228	4.21E-08	C C 2		
Nb 91	1.02E-09	C C 2			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	1.38E-05	C C 2			Th 232		8		
Nb 94	3.47E-06	C C 1			Th 234	1.85E-06	C C 2		
Mo 93	7.09E-08	C C 2			Pa 231		8		
Tc 97		8			Pa 233	2.26E-06	C C 2		
Tc 99	1.14E-05	C C 1			U 232	4.09E-08	C C 2		
Ru 106	3.06E-09	C C 1			U 233	9.56E-08	C C 2		
Pd 107	1.57E-07	C C 2			U 234	3.40E-06	C C 1		
Ag 108m	4.84E-06	C C 1			U 235	2.95E-08	C C 1		
Ag 110m		8			U 236	2.61E-07	C C 1		
Cd 109	1.77E-08	C C 2			U 238	1.85E-06	C C 1		
Cd 113m	3.06E-06	C C 2			Np 237	2.26E-06	C C 2		
Sn 119m		8			Pu 236		8		
Sn 121m	2.03E-05	C C 2			Pu 238	7.36E-04	C C 1		
Sn 123		8			Pu 239	8.05E-04	C C 1		
Sn 126	5.36E-07	C C 2			Pu 240	7.97E-04	C C 1		
Sb 125	5.09E-07	C C 1			Pu 241	9.95E-03	C C 1		
Sb 126	7.50E-08	C C 2			Pu 242	3.93E-06	C C 2		
Te 125m	1.28E-07	C C 2			Am 241	3.73E-03	C C 1		
Te 127m		8			Am 242m	4.94E-06	C C 2		
I 129	1.28E-07	C C 2			Am 243	6.26E-06	C C 2		
Cs 134	2.30E-08	C C 1			Cm 242	4.07E-06	C C 1		
Cs 135	7.82E-07	C C 2			Cm 243	5.47E-06	C C 1		
Cs 137	9.17E-03	C C 1			Cm 244	5.80E-05	C C 1		
Ba 133	2.60E-06	C C 1			Cm 245	9.18E-09	C C 2		
La 137	6.26E-09	C C 2			Cm 246	1.14E-09	C C 2		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145	1.12E-07	C C 2			Cf 250		8		
Pm 147	4.10E-07	C C 1			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	2.30E-04	C C 1			Unsp a		8		
Eu 152	5.41E-06	C C 1			Unsp b/g		8		
Eu 154	3.80E-05	C C 1			Total a	6.18E-03	*	0	*
Eu 155	2.05E-06	C C 1			Total b/g	3.35E-02	*	0	*

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