

WASTE STREAM	9E22/C	Miscellaneous Contaminated Items
--------------	--------	----------------------------------

SITE Berkeley

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		= 12.7	20.4
Future arisings:				0.0
Total future arisings:			0.0	0.0
Total waste volume:			12.7	20.4

Number of waste packages in stock: At 1.4.2025..... 4 packages

Comment on arising rates: -

Additional information on quantities: MCI in both Waste Cells was sorted and segregated in 2019/20. 12.74m³ from this waste stream has been loaded into 4 DCICs. Future arisings that were on this stream have been transferred to waste stream ID 9E23.

Uncertainty factors on volumes:

Stock (upper):	x 1.00	Arisings (upper):	x -
Stock (lower):	x 1.00	Arisings (lower):	x -

WASTE SOURCE Redundant contaminated plant items and material not suitable for disposal as LLW to the LLWR.

PHYSICAL CHARACTERISTICS

General description: Fine Filters, Trepanning Filter Marigold Gloves, Sand/Sludge. Vac Debris, Vac Debris and Metals, Metal mixed with plastic/ceramics, Metals, Trepanning Filter, soft waste, Paper, Concrete, Plastic, size reduced fuel reception tray and miscellaneous waste

Changes since waste generated: -

Bulk density (t/m³): ~ 0.22

Comment on density: The density of 0.22 t/m³ is the bulk density of the waste inside the containers.

CHEMICAL COMPOSITION

General description and components (%wt): The waste comprises of sand, steel and other components which have not been assessed. Fission products, actinides and other activation products will be present as contaminants. Metal (12.1% wt), Rubber (0.5% wt), Sludge (6.9% wt), Debris (24.5% wt), Plastic (3.7% wt), Paper (46.8% wt), Concrete (5.4% wt)

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 12.1	Metals all grouped into one, no data on sub types available in underpinning.	
Other ferrous metals.....	-	-	
Iron.....	-	-	
Aluminium.....	-	-	
Beryllium.....	-	-	
Cobalt.....	-	-	
Copper.....	-	-	
Lead.....	-	-	
Magnox/Magnesium.....	-	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	-	-	
Zircaloy/Zirconium.....	-	-	
Other metals.....	NE	Not fully assessed.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	NE 46.9	-	
Paper, cotton.....	~ 46.9	-	
Wood.....	NE	-	
Halogenated plastics.....	~ 1.9	-	
Total non-halogenated plastics.....	~ 1.9	-	
Condensation polymers.....	~ 0.93	-	
Others.....	~ 0.93	-	
Organic ion exchange materials.....	NE	-	
Total rubber.....	NE 0.49	Total rubber assumed an even split.	
Halogenated rubber.....	NE 0.25	-	
Non-halogenated rubber.....	NE 0.25	-	
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.....		-	
Inorganic sludges and flocs.....	~ 6.9	-	
Soil.....		-	
Brick/Stone/Rubble.....		-	
Cementitious material.....	= 5.4	-	
Sand.....		-	
Glass/Ceramics.....		-	
Graphite.....		-	
Desiccants/Catalysts.....		-	
Asbestos.....	= 0	-	
Non/low friable.....		-	
Moderately friable.....		-	
Highly friable.....		-	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 24.5	Labelled Debris in underpinning	

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.....	= 0	-
Explosive materials.....	= 0	-
Phosphorus.....	= 0	-
Hydrides.....	= 0	-
Biological etc. materials.....		-
Biodegradable materials.....	0	-
Putrescible wastes.....	= 0	-
Non-putrescible wastes.....		-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
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.....	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):

Yes		
	(%wt)	Type(s) and comment
EDTA.....	TR	-
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		

Comments on planned treatments:

-

Conditioning method:

Now packaged into 4 DCIC Type VI. Conditioned and dried using AVDS.

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
	3 m³ RS box	100.0	3.4	3.4	4	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): 0.22
 Conditioned density comment: Density is waste inside containers

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)	100.0		
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			
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 waste usually arises from the irradiated fuel handling and pond operations. Some of the waste came from AETP refurbishment. Components that have been associated with fuel pond operations are likely to be of high activity.

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

Measurement of radioactivities: Specific activity is a function of Station operating history.

Chemical form of radionuclides: H-3: Tritium may be present as water.
 C-14: Carbon 14 will be present as graphite dust particles.
 Cl-36: Chlorine 36 may be present in graphite dust particles.
 Se-79: The selenium content is insignificant.
 Tc-99: The technetium content is insignificant.
 I-129: -
 Ra: The radium isotope content is insignificant.
 Th: Traces of thorium may be present in metallic form, as oxide or as insoluble salts.
 U: Uranium isotopes are expected to be present as trace contamination in the form of natural uranium metal.
 Np: The neptunium content is insignificant.
 Pu: Plutonium isotopes are expected to be present as trace amounts from minor fuel leakage, probably metallic.

WASTE STREAM		9E22/C		Miscellaneous Contaminated Items					
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	1.44E-02	C C 2		8	Gd 153		8		8
Be 10				8	Ho 163		8		8
C 14	8.40E-03	C C 2		8	Ho 166m	1.23E-09	C C 2		8
Na 22				8	Tm 170		8		8
Al 26				8	Tm 171	9.99E-09	C C 2		8
Cl 36	1.66E-04	C C 2		8	Lu 174	1.22E-08	C C 2		8
Ar 39	4.06E-06	C C 2		8	Lu 176		8		8
Ar 42	2.60E-06	C C 2		8	Hf 178n	3.09E-05	C C 2		8
K 40				8	Hf 182		8		8
Ca 41				8	Pt 193	4.51E-07	C C 2		8
Mn 53				8	Tl 204		8		8
Mn 54	2.00E-09	C C 2		8	Pb 205		8		8
Fe 55	2.87E-04	C C 2		8	Pb 210		8		8
Co 60	2.62E-04	C C 2		8	Bi 208		8		8
Ni 59	1.91E-08	C C 2		8	Bi 210m		8		8
Ni 63	1.44E-04	C C 2		8	Po 210		8		8
Zn 65				8	Ra 223		8		8
Se 79	1.37E-08	C C 2		8	Ra 225		8		8
Kr 81				8	Ra 226		8		8
Kr 85	1.90E-04	C C 2		8	Ra 228		8		8
Rb 87				8	Ac 227		8		8
Sr 90	8.46E-04	C C 2		8	Th 227		8		8
Zr 93	7.99E-08	C C 2		8	Th 228		8		8
Nb 91				8	Th 229		8		8
Nb 92				8	Th 230		8		8
Nb 93m	5.05E-08	C C 2		8	Th 232		8		8
Nb 94	1.10E-05	C C 2		8	Th 234	2.58E-06	C C 2		8
Mo 93	6.58E-08	C C 2		8	Pa 231		8		8
Tc 97				8	Pa 233	4.95E-08	C C 2		8
Tc 99	6.37E-07	C C 2		8	U 232		8		8
Ru 106	1.10E-07	C C 2		8	U 233		8		8
Pd 107	2.12E-07	C C 2		8	U 234	2.07E-06	C C 2		8
Ag 108m	1.76E-05	C C 2		8	U 235	6.15E-08	C C 2		8
Ag 110m	1.59E-09	C C 2		8	U 236	3.10E-07	C C 2		8
Cd 109				8	U 238	2.58E-06	C C 2		8
Cd 113m	2.72E-05	C C 2		8	Np 237	4.95E-08	C C 2		8
Sn 119m	1.05E-09	C C 2		8	Pu 236		8		8
Sn 121m	5.10E-05	C C 2		8	Pu 238	1.14E-04	C C 2		8
Sn 123				8	Pu 239	1.15E-04	C C 2		8
Sn 126	3.19E-08	C C 2		8	Pu 240	1.50E-04	C C 2		8
Sb 125	3.30E-06	C C 2		8	Pu 241	3.90E-03	C C 2		8
Sb 126	4.47E-09	C C 2		8	Pu 242	3.23E-07	C C 2		8
Te 125m	8.27E-07	C C 2		8	Am 241	4.54E-04	C C 2		8
Te 127m				8	Am 242m	2.28E-06	C C 2		8
I 129	1.18E-09	C C 2		8	Am 243	7.70E-07	C C 2		8
Cs 134	1.24E-05	C C 2		8	Cm 242	1.88E-06	C C 2		8
Cs 135	3.15E-08	C C 2		8	Cm 243	6.50E-07	C C 2		8
Cs 137	3.47E-03	C C 2		8	Cm 244	1.45E-05	C C 2		8
Ba 133	9.45E-06	C C 2		8	Cm 245		8		8
La 137				8	Cm 246		8		8
La 138				8	Cm 248		8		8
Ce 144	4.80E-09	C C 2		8	Cf 249		8		8
Pm 145				8	Cf 250		8		8
Pm 147	1.31E-05	C C 2		8	Cf 251		8		8
Sm 147				8	Cf 252		8		8
Sm 151	1.76E-05	C C 2		8	Unsp a				
Eu 152	2.56E-05	C C 2		8	Unsp b/g				
Eu 154	2.71E-05	C C 2		8	Total a	8.57E-04	*	0	*
Eu 155	1.28E-05	C C 2		8	Total b/g	3.23E-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