

WASTE STREAM	7A36	Pyrochemical Wastes
---------------------	-------------	----------------------------

SITE AWE Aldermaston

SITE OWNER Ministry of Defence

WASTE CUSTODIAN AWE plc

WASTE TYPE ILW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	2.5 m ³
Future arisings -	1.4.2022 - 31.3.2030.....	1.0 m ³
	1.4.2031 - 31.3.2040.....	0.4 m ³
	1.4.2041 - 31.3.2050.....	0.4 m ³
	1.4.2051 - 31.3.2062.....	0.5 m ³
	1.4.2063 - 31.3.2080.....	0 m ³
Total future arisings:		2.3 m ³
Total waste volume:		4.8 m ³

Comment on volumes: Waste contained within a 205 litre drum, but constitutes to 20 x 1 litre packages per drum. Data reviewed in 2022 highlights a reduction in future arisings from the 2019 UKRWI. It is important to understand that the outer drums, which contain the waste packages, are just handling aids. It is the inner smaller packages that will be processed. A project is currently looking at the viability of repacking 50% of the waste.

Uncertainty factors on volumes: Stock (upper): x 2.0 Arisings (upper) x 5.0
 Stock (lower): x 0.5 Arisings (lower) x 0.5

WASTE SOURCE The waste are generated from processes used to refine metals.

PHYSICAL CHARACTERISTICS

General description: Mixed pyrochemical salts and crucible wastes.

Physical components (%wt): The composition of this waste has not been determined.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 3.15

Comment on density: Reviewed in 2022 and no change since the 2019 UKRWI.

CHEMICAL COMPOSITION

General description and components (%wt): -

Chemical state: -

Chemical form of radionuclides: H-3: Not present in waste stream
 C-14: Not present in waste stream
 Cl-36: Not present in waste stream
 Se-79: Not present in waste stream
 Tc-99: Not present in waste stream
 I-129: Not present in waste stream
 Ra: Only daughter products present from uranium in this waste stream. Oxide form
 Th: Only daughter products present from uranium in this waste stream. Oxide form
 U: Present as metal or metal oxide
 Np: Np-237 present in waste stream as oxide form from daughter product of Am-241 alpha decay.
 Pu: Present as metal or metal oxide

Metals and alloys (%wt): -

WASTE STREAM	7A36	Pyrochemical Wastes
---------------------	-------------	----------------------------

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	NE		
Iron.....	NE		
Aluminium.....	NE		
Beryllium.....	NE		
Cobalt.....	NE		
Copper.....	NE		
Lead.....	NE		
Magnox/Magnesium.....	NE		
Nickel.....	NE		
Titanium.....	NE		
Uranium.....	NE		
Zinc.....	NE		
Zircaloy/Zirconium.....	NE		
Other metals.....	NE		

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	NE		
Paper, cotton.....	NE		
Wood.....	NE		
Halogenated plastics	NE		
Total non-halogenated plastics.....	NE		
Condensation polymers.....	NE		
Others.....	NE		
Organic ion exchange materials....	NE		
Total rubber.....	NE		
Halogenated rubber	NE		
Non-halogenated rubber.....	NE		
Hydrocarbons.....	NE		
Oil or grease	NE		
Fuel.....	NE		
Asphalt/Tarmac (cont.coal tar)...	NE		
Asphalt/Tarmac (no coal tar)....	NE		
Bitumen.....	NE		
Others.....	NE		
Other organics.....	NE		

Other materials (%wt): -

WASTE STREAM	7A36	Pyrochemical Wastes
---------------------	-------------	----------------------------

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

Inorganic anions (%wt): -

	(%wt)	Type(s) and comment
Fluoride.....	NE	
Chloride.....	NE	
Iodide.....	NE	
Cyanide.....	NE	
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.....	NE	
Low flash point liquids.....	NE	
Explosive materials.....	NE	
Phosphorus.....	NE	
Hydrides.....	NE	
Biological etc. materials.....	NE	
Biodegradable materials.....	NE	
Putrescible wastes.....	NE	
Non-putrescible wastes.....	NE	

WASTE STREAM	7A36	Pyrochemical Wastes
---------------------	-------------	----------------------------

Corrosive materials.....	NE
Pyrophoric materials.....	NE
Generating toxic gases.....	NE
Reacting with water.....	NE
Higher activity particles.....	NE
Soluble solids as bulk chemical compounds.....	NE

Hazardous substances / -
non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	NE	
Benzene.....	NE	
Chlorinated solvents.....	NE	
Formaldehyde.....	NE	
Organometallics.....	NE	
Phenol.....	NE	
Styrene.....	NE	
Tri-butyl phosphate.....	NE	
Other organophosphates.....	NE	
Vinyl chloride.....	NE	
Arsenic.....	NE	
Barium.....	NE	
Boron.....	NE	
Boron (in Boral).....	NE	
Boron (non-Boral).....	NE	
Cadmium.....	NE	
Caesium.....	NE	
Selenium.....	NE	
Chromium.....	NE	
Molybdenum.....	NE	
Thallium.....	NE	
Tin.....	NE	
Vanadium.....	NE	
Mercury compounds.....	NE	
Others.....	NE	
Electronic Electrical Equipment (EEE)		
EEE Type 1.....	NE	
EEE Type 2.....	NE	
EEE Type 3.....	NE	
EEE Type 4.....	NE	
EEE Type 5.....	NE	

WASTE STREAM 7A36 Pyrochemical Wastes

Complexing agents (%wt): Not yet determined

	(%wt)	Type(s) and comment
EDTA.....	NE	Unlikely that complexing agents present but needs to be determined through sampling when waste is processed.
DPTA.....	NE	
NTA.....	NE	
Polycarboxylic acids.....	NE	
Other organic complexants.....	NE	
Total complexing agents.....	NE	

Potential for the waste to contain discrete items: Not yet determined.

PACKAGING AND CONDITIONING

Conditioning method: The length of storage and treatment process is undecided.

Plant Name: -

Location: -

Plant startup date: -

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m³/y incoming waste): -

Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	Not specified	100.0	NE	NE	NE

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: -

Other information: -

Conditioned density (t/m³): -

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing: Not yet determined

WASTE STREAM	7A36	Pyrochemical Wastes
---------------------	-------------	----------------------------

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

RADIOACTIVITY

Source: Plutonium contamination

Uncertainty: The total stock activity is based on a review of stock in 2022 and the activity figures from 2019, which have been decay corrected and adjusted to accommodate the volume.

Definition of total alpha and total beta/gamma: The totals in the table of radionuclide activities are the sums of the listed alpha or beta/gamma emitting radionuclides.

Measurement of radioactivities: A programme is ongoing to re-assay these wastes using PNCC and high resolution gamma spectrometry. Decay nuclides with a half-life of less than 3 months have been omitted.

Other information: -

WASTE STREAM 7A36 Pyrochemical Wastes

Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210	1.13E-13	CC 2	7.73E-12	CC 2
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210	9.55E-14	CC 2	7.31E-12	CC 2
Zn 65					Ra 223	1.90E-12	CC 2	4.41E-11	CC 2
Se 79					Ra 225	5.55E-14	CC 2	1.53E-12	CC 2
Kr 81					Ra 226	1.32E-12	CC 2	3.39E-11	CC 2
Kr 85					Ra 228	9.36E-17	CC 2	1.57E-15	CC 2
Rb 87					Ac 227	1.96E-12	CC 2	4.45E-11	CC 2
Sr 90					Th 227	1.90E-12	CC 2	4.36E-11	CC 2
Zr 93					Th 228	5.37E-17	CC 2	1.30E-15	CC 2
Nb 91					Th 229	5.62E-14	CC 2	1.54E-12	CC 2
Nb 92					Th 230	7.57E-10	CC 2	6.40E-09	CC 2
Nb 93m					Th 232	2.70E-16	CC 2	2.43E-15	CC 2
Nb 94					Th 234	5.60E-13	CC 2	1.69E-12	CC 2
Mo 93					Pa 231	1.69E-11	CC 2	1.52E-10	CC 2
Tc 97					Pa 233	2.4E-06	CC 2	2.82E-05	CC 2
Tc 99					U 232				
Ru 106					U 233	1.61E-10	CC 2	1.65E-09	CC 2
Pd 107					U 234	1.35E-05	CC 2	3.69E-05	CC 2
Ag 108m					U 235	1.33E-07	CC 2	3.97E-07	CC 2
Ag 110m					U 236	9.14E-07	CC 2	2.74E-06	CC 2
Cd 109					U 238	5.64E-13	CC 2	1.69E-12	CC 2
Cd 113m					Np 237	2.49E-06	CC 2	2.83E-05	CC 2
Sn 119m					Pu 236				
Sn 121m					Pu 238	3.80E-01	CC 2	3.14E-01	CC 2
Sn 123					Pu 239	1.12E+01	CC 2	1.12E+01	CC 2
Sn 126					Pu 240	2.57E+00	CC 2	2.57E+00	CC 2
Sb 125					Pu 241	5.16E+01	CC 2	1.62E+01	CC 2
Sb 126					Pu 242	3.03E-04	CC 2	3.03E-04	CC 2
Te 125m					Am 241	2.69E+00	CC 2	3.73E+00	CC 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137					Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152					Other b/g				
Eu 154					Total a	1.69E+01	CC 2	1.78E+01	CC 2
Eu 155					Total b/g	5.15E+01	CC 2	1.62E+01	CC 2

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 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