

WASTE STREAM	8A30	UCP Operational Wastes
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SITE Capenhurst

SITE OWNER Urenco

WASTE CUSTODIAN Urenco ChemPlants

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 116.6		
Future arisings:	1.4.2025 - 31.3.2026	271.1		
	1.4.2026 - 31.3.2027	271.1		
	1.4.2027 - 31.3.2028	271.1		
	1.4.2028 - 31.3.2055	7319.2		
Total future arisings:		8132.4		
Total waste volume:		8249.0		

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

Comment on arising rates: Arising based on 2024 figures for waste produced, 140 Cemented drums for the next 3 years then expected to increase to 270 drums. All other assumptions are based on prior experience of operations and outages and have been included in yearly volume figures.

Additional information on quantities: Expected increase in decontamination and maintenance, which will lead to more cemented drums (covered) but the effect on other wastes is currently unknown hence the uncertainty.

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper): x 1.25
Stock (lower): x 0.75 Arisings (lower): x 0.75

WASTE SOURCE

Waste from plant operations at UCP this includes deconversion of uranium hexafluoride to uranium oxide, uranium oxide storage, cylinder washing, residue recovery and various decontamination/maintenance activities. These wastes are items which have become contaminated during normal operations or maintenance operations (i.e. during outages)
Wastes included but not limited to:
Soft Waste
Non compactable wastes
Metallic wastes
Cemented drums
Incinerable Liquids

PHYSICAL CHARACTERISTICS

General description: Soft Waste (such as PPE, Wipes, poly sheeting etc)
Non compactable wastes (Filters, WEEE, Hoses, hard plastics and rubble)
Metallic wastes (Kiln Tubes, crinoline, flanges, pipes, metallic filters, valves, metallic hoses)
Cemented drums (these are produced from waste concentrate produced in the residue recovery facility which is used to treat cylinder washings and decontamination liquors.)
Most of these items are packaged in 210L drums, other than soft wastes which are placed in small poly bags, and then bulked into larger FIBCs.
Larger metallic items (such as kiln tubes) will be treated on a case by case basis and BAT determined.
Oils from plant maintenance.

Changes since waste generated: Metallic waste will be decontaminated where deemed BAT to do so, this will include dry and wet decontamination techniques.
Cemented drums produced residue recovery facility, <100ppm uranic liquors concentrated and then cemented in 210L drum.
All other wastes N/A

Bulk density (t/m³): ~ 0.66

Comment on density: This is value is based on weighted average bulk densities of the different materials present. These individual material densities are based on previous experience and consignments of those types of waste.

CHEMICAL COMPOSITION

General description and components (%wt):

Group 1 Soft Wastes & Non compactable - 79% (60% cellulose, 20% plastic, 15% rubber, 5% PFTE / polyester)
 Group 2 Metallic Wastes - 7% (Metallic waste stream: Nickel Alloy = 47%; Stainless Steel = 16%; Carbon Steel = 1%; and, Bronze Alloy = 36%. All values are estimates)
 Group 3 Cemented Drums - 13% (Drum and lost paddle = 20%. Cemented waste concentrate = 80%.)
 Group 4 Oils - 1%

Chemical state:

Neutral

Sheet metal proportion / thickness:

For metal wastes only; 5% ducting and 95% other fabricated items. Plate metals very limited or absent. Majority of items of the order of 10 to 10s cm in dimension. Larger items (up to 10m in length) will be sized reduced for chemical decontamination and waste management, depending on BAT.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 1.5	316L (96%) 304L (2%) and Duplex (2%)	
Other ferrous metals.....	~ 0.10	Mostly Carbon Steel, but some Cast Iron	
Iron.....	-	-	
Aluminium.....	-	-	
Beryllium.....	-	-	
Cobalt.....	-	-	
Copper.....	~ 2.4	Bronze Alloy cylinder plugs	
Lead.....	-	-	
Magnox/Magnesium.....	-	-	
Nickel.....	~ 3.0	Alloy 600 (50%) and C4 (50%)	
Titanium.....	-	-	
Uranium.....	< 0.01	-	
Zinc.....	-	-	
Zircaloy/Zirconium.....	-	-	
Other metals.....	-	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 39.5	Paper, cardboard, cotton wipes etc, wood, filters	
Paper, cotton.....	-	-	
Wood.....	-	-	
Halogenated plastics.....	~ 15.8	Various Hard and soft plastics	
Total non-halogenated plastics.....	~ 11.9	Various Hard and soft plastics	
Condensation polymers.....	-	-	
Others.....	-	-	
Organic ion exchange materials.....	-	-	
Total rubber.....	~ 11.9	PPE etc	
Halogenated rubber.....	-	-	
Non-halogenated rubber.....	-	-	
Hydrocarbons.....	1.0	-	
Oil or grease.....	~ 1.0	Incinerable oils from maintenance.	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	-	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	-	-	
Inorganic sludges and flocs.....	-	-	
Soil.....	-	-	
Brick/Stone/Rubble.....	-	-	
Cementitious material.....	~ 13.0	-	
Sand.....	-	-	
Glass/Ceramics.....	-	-	
Graphite.....	-	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	-	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
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.....	< 0.01	uranic based fluoride contaminants
Chloride.....		
Iodide.....		
Cyanide.....		
Carbonate.....		
Nitrate.....		
Nitrite.....		
Phosphate.....		
Sulphate.....		
Sulphide.....		

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	TR	Acids/Alkalines including HF.
Low flash point liquids.....		
Explosive materials.....		
Phosphorus.....		
Hydrides.....		
Biological etc. materials.....		
Biodegradable materials.....		
Putrescible wastes.....		
Non-putrescible wastes.....		
Corrosive materials.....		
Pyrophoric materials.....		
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.....		
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.....		
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	~ 1.0
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation	Off-site	~ 7.0
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	On-site	~ 13.0
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation	Off-site	~ 79.0
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments:

None - covers soft waste/non compactable wastes that are currently sent as LA-LLW to Radioactive permitted landfill.

Conditioning method:

No conditioning plants on site

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

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Further information on the conditioning matrix:

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Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
-	-	-	-	-	-

Range in container waste loading:

Other information on packaging and conditioning:

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Conditioned density (t/m³):

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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)	~ 92.0	~ 1.0	2025
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	~ 1.0	~ 0.80	2025
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site	~ 7.0	~ 4.0	2025
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:

10 13 11, 20 03 01, 15 02 03

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source:	Depleted UF6 tails deconversion, cylinder washing, metal decontamination and residue recovery processes. Wastes have been contaminated during operations with uranic material. There is an assumption that this waste stream will only cover waste produced during the processing of Non-Irradiated uranium for the next 10 years.
Uncertainty:	Based on facility design assessments, limited sample data and limited operational experience. Further sampling is required to reduce uncertainty.
Measurement of radioactivities:	Where possible Intrusive sampling and non-destructive HRGS Assay, however leans heavy in to the theoretical estimates. Fingerprint produced based on theoretical information and limited sampling complete to confirm this assumption. HRGS used to determine U-235 then rest of the radionuclides are derived from this measurement.
Chemical form of radionuclides:	H-3: N/A C-14: N/A Cl-36: N/A Se-79: N/A Tc-99: Trace quantities present as Tc(IV) as TcO2 and Tc(VII) as pertechnetate. I-129: N/A Ra: N/A Th: Thorium nitrate U: U3O8, UO2F2 and uranyl nitrate Np: Trace quantities potentially in nitrate form Pu: Trace quantities potentially in nitrate form

WASTE STREAM 8A30 UCP Operational Wastes									
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					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					Ti 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228	~ 4.36E-09	B B 2		
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99	~ 9.90E-10	B B 2	~ 9.90E-10	B B 2	U 232	~ 5.41E-09	B B 2	~ 5.41E-09	B B 2
Ru 106					U 233				
Pd 107					U 234	~ 1.53E-06	B B 2	~ 1.53E-06	B B 2
Ag 108m					U 235	~ 1.00E-07	B B 2	~ 1.00E-07	B B 2
Ag 110m					U 236	~ 1.98E-10	B B 2	~ 1.98E-10	B B 2
Cd 109					U 238	~ 4.96E-06	B B 2	~ 4.96E-06	B B 2
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
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					Unsp a				
Eu 152					Unsp b/g				
Eu 154					Total a	6.60E-06	*	6.59E-06	*
Eu 155					Total b/g	9.95E-10	*	9.95E-10	*

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