

WASTE STREAM	8A03	UUK Operational waste
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SITE Capenhurst

SITE OWNER Urenco

WASTE CUSTODIAN Urenco

WASTE TYPE VLLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	130.0		
Future arisings:	1.4.2025 - 31.3.2026	220.0		
	1.4.2026 - 31.3.2027	213.0		
	1.4.2027 - 31.3.2028	220.0		
	1.4.2028 - 31.3.2055	4530.0		
Total future arisings:		5183.0		
Total waste volume:		5313.0		

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

Comment on arising rates: Arisings have been determined via known generation rates. The site is also currently going through an expansion program, requiring the use of existing plant areas. Redundant plant arisings will be accelerated and decommissioned earlier than anticipated. The sites plan is also preparing to de-plant other Enrichment facilities. With the expansion plans, this will increase the day to day arisings. All these factors have significantly increased the previous estimates. In the future the site is hoping to invest in new technologies, focusing on diversion improvements, this will reduce the volume of radioactive waste.

Additional information on quantities: Volumes based on current rate of arising and the increased decommissioning activities.

Uncertainty factors on volumes: Stock (upper): x 1.05 Arisings (upper): x 2.00
Stock (lower): x 0.95 Arisings (lower): x 0.50

WASTE SOURCE The waste arises from centrifuge plant decommissioning activities, daily operations and maintenance activities, auxiliary activities such as chemistry laboratories and a small fraction from clean-up. The waste will also arise from planned outages. The waste consists of PPE, Cardboard, Wipes, Filters, plastic, WEEE, oils, chemicals, aqueous and no-aqueous wastes and other compactable/non-compactable wastes.

PHYSICAL CHARACTERISTICS

General description: Operational wastes including metallic stainless steel, aluminium, PPE, Wipes, Filters, WEEE, Plastics, liquids and chemicals etc.

Changes since waste generated: None.

Bulk density (t/m³): ~ 0.80

Comment on density: Assumes average of 40 kg of waste per ca. 200 litre drum
Assumes average of 1te of metal waste (aluminium and steel) in a FIBC

CHEMICAL COMPOSITION

General description and components (%wt): 19% cellulose, 6% plastic, 66% metal, 4% rubber, 4% PFTE / polyester, Oils & chemicals 1% (All are estimates)

Chemical state: Neutral

Sheet metal proportion / thickness: Metals are various, some flat surfaces, some cylindrical, some vessels. Mostly between 1- 10cm thickness. Some larger items upto 4m long once size reduced. All items to be size reduced for either further treatment, chemical decontamination or disposal.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 34.0	Unknown but likely a 304L 316L split	
Other ferrous metals.....	~ 5.0	Mostly Carbon Steel	
Iron.....	~ 9.0	Unknown	
Aluminium.....	~ 12.0	Unknown	
Beryllium.....	-	-	
Cobalt.....	-	-	
Copper.....	~ 5.0	Unknown	
Lead.....	~ 1.0	Unknown	
Magnox/Magnesium.....	-	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	-	-	
Zircaloy/Zirconium.....	-	-	
Other metals.....	-	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 19.0	Paper, cardboard, cotton wipes etc, wood, filters	
Paper, cotton.....	-	-	
Wood.....	-	-	
Halogenated plastics.....	~ 4.0	Various Hard and soft plastics	
Total non-halogenated plastics.....	~ 6.0	Various Hard and soft plastics	
Condensation polymers.....	-	-	
Others.....	-	-	
Organic ion exchange materials.....	-	-	
Total rubber.....	~ 4.0	Gaskets and PPE	
Halogenated rubber.....	-	-	
Non-halogenated rubber.....	-	-	
Hydrocarbons.....	0.50	-	
Oil or grease.....	0.50	Incinerable oils from machinery and 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.....	-	-	
Sand.....	-	-	
Glass/Ceramics.....	-	-	
Graphite.....	-	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	-	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	0.25	From decontamination and washing equipment and facilities	
Free non-aqueous liquids.....	0.25	Chemicals from various cleaning methods	
Powder/Ash.....	-	-	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	~ 0.30	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.....	-	-
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.....	-	-
	< 5	Switch gears, electrical control panels with PCBs removed, consumer units, wiring, and connection boxes.

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off-site	Stream volume %
Size reduction	On-site	~ 66.0
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration	Off-site	~ 1.0
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	~ 66.0
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None	Off-site	~ 33.0

Comments on planned treatments:

Waste that can be demonstrated as Out of Scope of RSR will be managed by the Facility Management Contractor following the Waste Hierarchy. Some soft waste and non compactable waste sent to Permitted Landfill, Some Aqueous and Non-Aqueous sent for incineration. Metals for size reduction and then off-site treatment.

Conditioning method:

Waste Metallic items will firstly be characterised as either radioactive or non-radioactive on-site, reducing the amount of radioactive material, requiring disposal. The remaining metallic waste will be size reduced and packaged into suitable waste containers, to maximise loading efficiency and comply with the relevant Transport Regulations, as outlined and detailed in the Site Characterisation BAT.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

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
1 t flexible intermediate bulk container (FIBC)	-	-	-	-	-
210 l steel drum (TC14)	-	-	-	-	-

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			
Expected to be consigned to a Landfill Facility	~ 23.0	~ 0.80	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	~ 1.0	~ 1.0	
Expected to be consigned to a Metal Treatment Facility	~ 66.0	~ 0.80	
Expected to be Out of Scope	~ 10.0	~ 0.80	
Expected to be recycled / reused			
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility: 16 02 13*, 16 10 02, 17 04 02, 17 04 05, 17 04 07, 13 03 10*, 20 03 01

Opportunities for alternative disposal routing: Not yet determined

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

RADIOACTIVITY

Source: Uranium enrichment and recovery operations.

Uncertainty: Variations in activity will occur due to changes in uranium concentration and enrichment.

Measurement of radioactivities: Intrusive sampling and non-destructive HRGS Assay

Chemical form of radionuclides: H-3: -
C-14: -
Cl-36: -
Se-79: -
Tc-99: Trace quantities present as Tc(IV) as TcO₂ and Tc(VII) as pertechnetate.
I-129: -
Ra: -
Th: -
U: Uranyl fluoride (70%), uranium tetrafluoride (30%).
Np: Trace quantities present as the NpO₂ ++ ion.
Pu: -

WASTE STREAM		8A03		UUK Operational waste					
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	~ 5.94E-08 A A 2		~ 5.94E-08 A A 2		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				
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				
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					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
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								
Eu 155	Total b/g								
	2.76E-06 *								
	5.94E-08 *								
	2.76E-06 *								
	5.94E-08 *								

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