WASTE STREAM 8A33 UCP Non-Combustible Solid LLW

SITE Capenhurst

SITE OWNER Urenco

WASTE CUSTODIAN URENCO Chemplants Ltd

WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m³
Future arisings -	1.4.2019 - 31.3.2049.....	~~30.0 m³
	1.4.2050 - 31.3.2055.....	~~500.0 m³
	1.4.2056 - 31.3.2114.....	~~14.5 m³
	1.4.2115 - 31.3.2119.....	~~100.0 m³
Total future arisings:		644.5 m³
Total waste volume:		644.5 m³

Comment on volumes: 2019-2049 relates to deconversion operations and the following five years to decommissioning of the main plant. The period between 2056 and 2114 relates to maintenance of the Uranium Oxide Store and the final five years to uranium oxide export from the store and its decommissioning. At time of initial inventory production the TMF is not yet operational and all future arising estimates are approximations. During operations, annual arisings will vary depending outage needs. Decommissioning needs are not yet underpinned.

Uncertainty factors on volumes:

Stock (upper):	x	Arisings (upper)	x 3.0
Stock (lower):	x	Arisings (lower)	x 0.5

WASTE SOURCE Non-metalic and non-combustible solids, primarily from decommissioning activities associated with surface contamination of building materials. Some allowance for future generation of contaminated soil is provided for.

PHYSICAL CHARACTERISTICS

General description: Non-metalic and non-combustible solids such as concrete and potentially some soil Waste generated through some process of concrete decontamination and / or crushed concrete (rebar removed) if surface decontamination to Out of Scope levels is not practicable.

Physical components (%wt): 87.5% concrete, 10% soil and 2.5% glass and other materials

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1.6

Comment on density: Allows for bulking such that crushed concrete has a lower density than that of poured concrete

CHEMICAL COMPOSITION

General description and components (%wt): 87.5% concrete, 10% soil and 2.5% glass and other materials

Chemical state: Alkali

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 pertechnate.
I-129: N/A
Ra: N/A
Th: Thorium nitrate
U: U308, UO2F2 and uranyl nitrate
Np: Trace quantities potentially in nitrate form
Pu: Trace quantities potentially in nitrate form

Metals and alloys (%wt): None

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	Stainless steel	
	Other ferrous metals	
	Iron	
	Aluminium	
	Beryllium	
	Cobalt	
	Copper	
	Lead	
	Magnox/Magnesium	
	Nickel	
	Titanium	
	Uranium	<0.01
	Zinc	
	Zircaloy/Zirconium	
	Other metals	
Organics (%wt):	See below	
	Total cellulosics	0
	Paper, cotton	0
	Wood	0
	Halogenated plastics	0
	Total non-halogenated plastics	0
	Condensation polymers	0
	Others	0
	Organic ion exchange materials	0
	Total rubber	0
	Halogenated rubber	0
	Non-halogenated rubber	0
	Hydrocarbons	
	Oil or grease	
	Fuel	
	Asphalt/Tarmac (cont.coal tar)	
	Asphalt/Tarmac (no coal tar)	
	Bitumen	
	Others	
	Other organics	0
Other materials (%wt):	May include graphite condensor blocks	
	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs	0
	Soil	~~10.0
	Brick/Stone/Rubble	0
	Cementitious material	~~87.5
	Sand	0
	Glass/Ceramics	~~2.5

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	Graphite.....		
	Desiccants/Catalysts.....	0	
	Asbestos.....	0	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....	0	
Inorganic anions (%wt):	Trace quantities may be present		
	Fluoride.....	<0.01	Traces of uranyl fluoride
	Chloride.....	0	
	Iodide.....	0	
	Cyanide.....	0	
	Carbonate.....	<0.01	Traces of uranyl carbonate
	Nitrate.....	<0.01	Traces of uranyl nitrate
	Nitrite.....	0	
	Phosphate.....	<0.01	Traces of uranyl phosphate
	Sulphate.....	0	
	Sulphide.....	0	
Materials of interest for waste acceptance criteria:	Drummed incinerable solids suitable for Radioactive Substances Regulation disposal via incineration		
	Combustible metals.....	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.....	0	
	Corrosive materials.....	0	
	Pyrophoric materials.....	0	
	Generating toxic gases.....	0	
	Reacting with water.....	0	
	Active particles.....	0	
	Soluble solids as bulk chemical compounds.....	0	
Hazardous substances / non hazardous pollutants:	Trace HF contamination possible		
	Acrylamide.....		
	Benzene.....	0	
	Chlorinated solvents.....		

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Formaldehyde	
Organometallics	
Phenol	0
Styrene	
Tri-butyl phosphate	0
Other organophosphates	
Vinyl chloride	0
Arsenic	0
Barium	
Boron	0
Cadmium	0
Caesium	
Selenium	0
Chromium	0
Molybdenum	0
Thallium	
Tin	0
Vanadium	0
Mercury compounds	
Others	0
Electronic Electrical Equipment (EEE)	
EEE Type 1	
EEE Type 2	
EEE Type 3	
EEE Type 4	
EEE Type 5	

Complexing agents (%wt): No

EDTA	
DPTA	
NTA	
Polycarboxylic acids	
Other organic complexants	
Total complexing agents	

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)		
Incineration		
Solidification		
Decontamination		
Metal treatment		
Size reduction		
Decay storage		
Recyling / reuse		
Other / various	Off-site	~~100.0
None		

Comment on planned treatments: Non-combustible solid LLW to be disposed of via landfill. Excludes demolition waste that can be demonstrated as Out of Scope of RSR.

Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	
Expected to be consigned to a Landfill Facility	~~100.0
Expected to be consigned to an On-Site Disposal Facility	
Expected to be consigned to an Incineration Facility	
Expected to be consigned to a Metal Treatment Facility	
Expected to be consigned as Out of Scope	
Expected to be recycled / reused	
Disposal route not known	

Upcoming (2019/20-2021/22) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be consigned to an On-Site Disposal Facility			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be consigned as Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

Waste Packaging for Disposal: (Not applicable to this waste stream)

Container	Stream volume %	Waste loading m³	Number of packages
1/3 Height IP-1 ISO			
2/3 Height IP-2 ISO			
1/2 Height WAMAC IP-2 ISO			
1/2 Height IP-2 Disposal/Re-usable ISO			
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: -

Waste Planned for Disposal at the LLW Repository: (Not applicable to this waste stream)

Container voidage: -

Waste Characterisation Form (WCH): -

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Waste consigned for disposal to LLWR in year of generation:	-
Potential for the waste to contain discrete items:	-

Non-Containerised Waste for In-Vault Grouting: (Not applicable to this waste stream)

Stream volume (%):	-
Waste stream variation:	-
Bounding cuboidal volume:	
Inaccessible voidage:	-
Other information:	-

RADIOACTIVITY

Source:	Depleted UF6 tails deconversion, cylinder washing, metal decontamination and residue recovery processes.
Uncertainty:	Based on facility design assessment and not yet underpinned by operational experience. Arising during decomissioning not yet underpinned.
Definition of total alpha and total beta/gamma:	Initial decay chain and short-lived (i.e. less than three month) decay products of U-238 not listed and expected to be in equilibrium with U-238.
Measurement of radioactivities:	Currently theoretical estimate (TMF not yet operational).
Other information:	Other Uranium series decay products not present as the source is chemically purified Uranium.

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	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				
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			~~2.23E-07	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			~~2.71E-10	B B 2	U 232			~~4.26E-07	B B 2
Ru 106			~~1.54E-18	B B 2	U 233				
Pd 107					U 234			~~2.76E-05	B B 2
Ag 108m					U 235			~~6.01E-07	B B 2
Ag 110m					U 236			~~5.59E-06	B B 2
Cd 109					U 238			~~2.95E-05	B B 2
Cd 113m					Np 237			~~1.01E-10	B B 2
Sn 119m					Pu 236				
Sn 121m					Pu 238			~~6.12E-16	B B 2
Sn 123					Pu 239			~~6.12E-16	B B 2
Sn 126					Pu 240			~~6.12E-16	B B 2
Sb 125					Pu 241			~~1.02E-12	B B 2
Sb 126					Pu 242			~~6.12E-16	B B 2
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					Other a				
Eu 152					Other b/g				
Eu 154					**Total a**	**0**		**~~6.4E-05**	**B B 2**
Eu 155					**Total b/g**	**0**		**~~2.72E-10**	**B B 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