WASTE STREAM 7A116 Decommissioning LLW - Miscellaneous

SITE AWE Aldermaston

SITE OWNER Ministry of Defence

WASTE CUSTODIAN AWE plc

WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0.2 m³
Future arisings -	1.4.2019 - 31.3.2030.....	0 m³
	1.4.2030 - 31.3.2033.....	176.0 m³
	1.4.2033 - 31.3.2036.....	25.0 m³
	1.4.2036 - 31.3.2045.....	0 m³
	1.4.2045 - 31.3.2048.....	443.0 m³
	1.4.2048 - 31.3.2080.....	0 m³
Total future arisings:		644.0 m³
Total waste volume:		644.2 m³

Comment on volumes: Future arisings are estimated based on the decommissioning plans for facilities on site, which have been recently reviewed. Stock volumes are considered to be accurate. The total volume of arisings will depend on the longevity of the AWE site, estimates have been made based on a site closure date of 2080.

Uncertainty factors on volumes:

Stock (upper):	x 1.0	Arisings (upper)	x 5.0
Stock (lower):	x 1.0	Arisings (lower)	x 0.3

WASTE SOURCE Decommissioning of reactor containing buildings and other small facilities handling miscellaneous radionuclides.

PHYSICAL CHARACTERISTICS

General description: The waste contains metal (21.4%), grout (78.2%) and plastics (0.4%).

Physical components (%wt): The waste contains metal (21.4%), grout (78.2%) and plastics (0.4%). The composition is based on the stock from the 2016 RWI as this is considered more representative than the 0.2m³ currently in stock.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1.8

Comment on density: This figure has been determined from the 'in-stock' waste. Assumed that the 2016 figure still stands true.

CHEMICAL COMPOSITION

General description and components (%wt): The waste contains metal (21.4%), grout (78.2%) and plastics (0.4%).

Chemical state: Neutral

Chemical form of radionuclides: -

Metals and alloys (%wt): A number of drums contain aluminium mixed with grout, other metal is contained within drums, and is therefore not bulk.

Stainless steel.....

Other ferrous metals..... 5.6

Iron.....

Aluminium..... 15.0

Beryllium.....

Cobalt.....

Copper..... 0.80

Lead.....

Magnox/Magnesium.....

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	Nickel.....		
	Titanium.....		
	Uranium.....		
	Zinc.....		
	Zircaloy/Zirconium.....		
	Other metals.....		
Organics (%wt):	-		
	Total cellulosics.....		
	Paper, cotton.....		
	Wood.....		
	Halogenated plastics	0.10	PVC.
	Total non-halogenated plastics.....	0.30	
	Condensation polymers.....		
	Others.....		
	Organic ion exchange materials....		
	Total rubber.....		
	Halogenated rubber		
	Non-halogenated rubber.....		
	Hydrocarbons.....		
	Oil or grease		
	Fuel.....		
	Asphalt/Tarmac (cont.coal tar)...		
	Asphalt/Tarmac (no coal tar).....		
	Bitumen.....		
	Others.....		
	Other organics.....		
Other materials (%wt):	-		
	Inorganic ion exchange materials.		
	Inorganic sludges and flocs.....		
	Soil.....		
	Brick/Stone/Rubble.....		
	Cementitious material.....	78.2	SP/F4 grout.
	Sand.....		
	Glass/Ceramics.....		
	Graphite.....		
	Desiccants/Catalysts.....		
	Asbestos.....		
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....		
	Free non-aqueous liquids.....		

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	Powder/Ash.....		
Inorganic anions (%wt):	-		
	Fluoride.....		
	Chloride.....		
	Iodide.....		
	Cyanide.....		
	Carbonate.....		
	Nitrate.....		
	Nitrite.....		
	Phosphate.....		
	Sulphate.....		
	Sulphide.....		
Materials of interest for waste acceptance criteria:	-		
	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:	-		
	Acrylamide.....	0	
	Benzene.....	NE	
	Chlorinated solvents.....	0	
	Formaldehyde.....	0	
	Organometallics.....	0	
	Phenol.....	NE	
	Styrene.....	0	
	Tri-butyl phosphate.....	NE	
	Other organophosphates.....	0	
	Vinyl chloride.....	P	PVC.
	Arsenic.....	NE	

Barium	0
Boron	NE
Cadmium	NE
Caesium	0
Selenium	NE
Chromium	NE
Molybdenum	NE
Thallium	0
Tin	NE
Vanadium	NE
Mercury compounds	0
Others	NE
Electronic Electrical Equipment (EEE)	
EEE Type 1	
EEE Type 2	
EEE Type 3	
EEE Type 4	
EEE Type 5	

Complexing agents (%wt): Yes

EDTA	
DPTA	
NTA	
Polycarboxylic acids	TR
Other organic complexants	TR
Total complexing agents	TR

Traces of complexing agents will be present because of their use as decontaminants.

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)	Off-site	~29.0
Incineration	Off-site	~28.0
Solidification		
Decontamination		
Metal treatment	Off-site	~23.0
Size reduction		
Decay storage		
Recyling / reuse		
Other / various		
None	Off-site	~20.0

Comment on planned treatments: Waste treatment percentages have been estimated based on predicted waste volumes and the current corporate BAT. However, there are no new wastes predicted to enter this stream for eleven years, the disposal routes could change in this time.

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Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	~29.0
Expected to be consigned to a Landfill Facility	~20.0
Expected to be consigned to an On-Site Disposal Facility	
Expected to be consigned to an Incineration Facility	~28.0
Expected to be consigned to a Metal Treatment Facility	~23.0
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:

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	29.0	17	11
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: Wastes going to the LLWR are expected to be supercompacted, this may not be the case.

Waste Planned for Disposal at the LLW Repository:

Container voidage: Voidage will be low if wastes are supercompacted.

Waste Characterisation Form (WCH): The waste does not meet the LLWR's Waste Acceptance Criteria (WAC). The waste does not have a current WCH.

Waste consigned for disposal to LLWR in year of generation: No. Holding current in-stock wastes until resource is available to complile WCH.

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

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: -

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RADIOACTIVITY

Source:	uranium, plutonium and Cs-137, Sr-90, Ce-144, Zr-95, Nb-95, Na-22, Co-60, Zn-65, Am-241, Ra-226 and Th-232.
Uncertainty:	The gross alpha and gross beta activities of the in-stock wastes are accurate, the radionuclide breakdown has been estimated. The waste arising activities have been estimated from the instock data.
Definition of total alpha and total beta/gamma:	Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.
Measurement of radioactivities:	Activity is determined by a variety of analytical techniques: radiochemical analysis, high and low resolution gamma monitoring techniques, passive neutron coincidence counting and liquid scintillation counting.
Other information:	Decay nuclides with a half life of less than 3 months have been omitted.

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Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3			1.42E-04	C C 2	Gd 153				
Be 10					Ho 163				
C 14				5	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				5
Mn 54					Pb 205				
Fe 55			6.06E-05	C C 2	Pb 210				
Co 60	4.36E-04	B B 2	4.85E-04	C C 2	Bi 208				
Ni 59				5	Bi 210m				
Ni 63			1.85E-04	C C 2	Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226	1.58E-06	B B 2		5
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90				5	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232	1.59E-06	B B 2		5
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232			7.50E-11	C C 2
Ru 106				5	U 233				
Pd 107					U 234				5
Ag 108m					U 235				5
Ag 110m				5	U 236				5
Cd 109					U 238				5
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				5
Sn 123					Pu 239			1.23E-07	C C 2
Sn 126					Pu 240				5
Sb 125					Pu 241				5
Sb 126					Pu 242			1.05E-10	C C 2
Te 125m					Am 241			5.44E-09	C C 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137	5.35E-04	B B 2	3.78E-05	C C 2	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144				5	Cf 249				
Pm 145					Cf 250				
Pm 147				5	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152					Other b/g				
Eu 154					**Total a**	**3.17E-06**	**B B 2**	**1.29E-07**	**C C 2**
Eu 155					**Total b/g**	**9.70E-04**	**B B 2**	**9.10E-04**	**C C 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