WASTE STREAM 7A34 Low Activity Liquids (excluding Hg)

SITE AWE Aldermaston

SITE OWNER Ministry of Defence

WASTE CUSTODIAN AWE plc

WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	8.1 m³
Future arisings -	1.4.2019 - 31.3.2022.....	14.0 m³
	1.4.2022 - 31.3.2025.....	9.0 m³
	1.4.2025 - 31.3.2028.....	3.0 m³
	1.4.2028 - 31.3.2031.....	2.0 m³
	1.4.2031 - 31.3.2038.....	0 m³
	1.4.2038 - 31.3.2061.....	20.0 m³
	1.4.2061 - 31.3.2080.....	0 m³
Total future arisings:		48.0 m³
Total waste volume:		56.1 m³

Comment on volumes: Around 52% of arisings are oils from a single source, 25% are effluent sludges, most other arisings are legacy. It is expected that wastes in this code can be readily be disposed of, higher activity wastes with no disposal route have been captured under appropriate ILW codes. There is uncertainty in stock volumes and arising rate, because 'in facility' liquids are not recorded in the same manner as centrally stored wastes. Arising data has been taken from facility predictions.

Uncertainty factors on volumes:

Stock (upper):	x 2.0	Arisings (upper)	x 5.0
Stock (lower):	x 0.5	Arisings (lower)	x 0.25

WASTE SOURCE Contaminated liquids originate from four main sources - cutting oil from machining operations, lubricating oils, spent oil from vacuum pumps and sludge from liquid effluent treatment. The former are most heavily contaminated via pieces of swarf, and the latter three by fine particles. Other liquids include coolants and chemicals.

PHYSICAL CHARACTERISTICS

General description: Liquids contaminated with pieces of swarf, fine particles and sludge / liquids with potential to contain contamination. Some wastes were treated to reduce volume/remove uncontaminated constituents prior to storage as waste (e.g. ultrafiltration to remove water phase).

Physical components (%wt): Mainly hydrocarbon oil, oil/water mixtures (cutting oils) or sludges. Some acids.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 0.5

Comment on density: Reviewed for 2019 RWI and the new density, based on stock data, is identical to the figure quoted in the 2016 UK RWI.

CHEMICAL COMPOSITION

General description and components (%wt): Hydrocarbon oils, sludge, water and some chemicals.

Chemical state: Neutral

Chemical form of radionuclides: U: Various.
Pu: Various.

Metals and alloys (%wt): -

Stainless steel.....

Other ferrous metals.....

Iron.....

Aluminium.....

Beryllium.....

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	Cobalt.....		
	Copper.....		
	Lead.....		
	Magnox/Magnesium.....		
	Nickel.....		
	Titanium.....		
	Uranium.....	NE	Uranium swarf present but quantity is undetermined.
	Zinc.....		
	Zircaloy/Zirconium.....		
	Other metals.....		
Organics (%wt):	-		
	Total cellulosics.....		
	Paper, cotton.....		
	Wood.....		
	Halogenated plastics		
	Total non-halogenated plastics.....		
	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.....	P	Covered below under non-aqueous liquids.
Other materials (%wt):	-		
	Inorganic ion exchange materials.		
	Inorganic sludges and flocs.....	~25.0	
	Soil.....		
	Brick/Stone/Rubble.....		
	Cementitious material.....		
	Sand.....		
	Glass/Ceramics.....		
	Graphite.....		
	Desiccants/Catalysts.....		
	Asbestos.....		
	Non/low friable.....		

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	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	~10.0	Acids, aqueous liquids, sludges.
	Free non-aqueous liquids.....	~65.0	Oils, coolants.
	Powder/Ash.....		
Inorganic anions (%wt):	-		
	Fluoride.....	NE	
	Chloride.....	NE	
	Iodide.....		
	Cyanide.....		
	Carbonate.....	NE	
	Nitrate.....	NE	
	Nitrite.....	NE	
	Phosphate.....	NE	
	Sulphate.....	NE	
	Sulphide.....	NE	
Materials of interest for waste acceptance criteria:	These wastes are not suitable for LLWR disposal as they are liquid.		
	Combustible metals.....	NE	
	Low flash point liquids.....	NE	
	Explosive materials.....	NE	
	Phosphorus.....	NE	
	Hydrides.....	NE	
	Biological etc. materials.....	P	
	Biodegradable materials.....	P	
	Putrescible wastes.....	0	
	Non-putrescible wastes.....	P	Biodegradeable oils / coolants.
	Corrosive materials.....	P	Acids.
	Pyrophoric materials.....	NE	
	Generating toxic gases.....	NE	Potentially acids.
	Reacting with water.....	P	Conc. acids.
	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	

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	Tri-butyl phosphate.....	NE	
	Other organophosphates.....	0	
	Vinyl chloride.....	0	
	Arsenic.....	NE	Likely to be present in some liquids / acids.
	Barium.....	0	
	Boron.....	NE	Likely to be present in some liquids / acids.
	Cadmium.....	NE	Likely to be present in some liquids / acids.
	Caesium.....	TR	
	Selenium.....	NE	Likely to be present in some liquids / acids.
	Chromium.....	NE	Likely to be present in some liquids / acids.
	Molybdenum.....	NE	Likely to be present in some liquids / acids.
	Thallium.....	0	
	Tin.....	NE	Likely to be present in some liquids / acids.
	Vanadium.....	NE	Likely to be present in some liquids / acids.
	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):	Not yet determined		
	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	Off-site	~97.0
Solidification		
Decontamination		
Metal treatment		
Size reduction		
Decay storage		
Recyling / reuse	Off-site	~3.0
Other / various		
None		

Comment on planned treatments: Free liquids cannot be disposed of to the LLWR. Most liquids will be incinerated, some will be treated by NNL in order to re-use the uranium.

Disposal Routes:

Disposal Route	Stream volume %
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	~97.0
Expected to be consigned to a Metal Treatment Facility	
Expected to be consigned as Out of Scope	
Expected to be recycled / reused	~3.0
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 m^3	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: Not intended for LLWR

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:	This waste contains tritium, plutonium and uranium contamination, and could contain other minor species.
Uncertainty:	The stock waste activity is accurate. Future arisings were estimated using predicted volumes based upon stock activities. Fingerprint information was sought from the existing stock data on the SRWMRS Database.
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:	The majority of oils were assayed using a form of high resolution gamma spectrometry, with an associated appropriate model. Some oils were sampled and samples were destructively analysed for appropriate radionuclides.
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					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	3.30E-06	B B 2	3.30E-06	C C 2
Ag 108m					U 235	1.12E-07	B B 2	1.12E-07	C C 2
Ag 110m					U 236	1.30E-08	B B 2	1.30E-08	C C 2
Cd 109					U 238	1.66E-06	B B 2	1.66E-06	C C 2
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	5.16E-09	B B 2	5.16E-09	C C 2
Sn 123					Pu 239	1.13E-07	B B 2	1.13E-07	C C 2
Sn 126					Pu 240	2.63E-08	B B 2	2.63E-08	C C 2
Sb 125					Pu 241	5.24E-06	B B 2	5.24E-06	C C 2
Sb 126					Pu 242	1.14E-12	B B 2	1.14E-12	C C 2
Te 125m					Am 241	1.65E-07	B B 2	1.65E-07	C C 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**	**5.39E-06**	**B B 2**	**5.39E-06**	**C C 2**
Eu 155					**Total b/g**	**5.24E-06**	**B B 2**	**5.24E-06**	**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