WASTE STREAM 5C323 LETP Land Remediation VLLW and LA-LLW

SITE Harwell

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE VLLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m³
Future arisings -	1.4.2019 - 31.3.2020.....	4188.8 m³
Total future arisings:		4188.8 m³
Total waste volume:		4188.8 m³

Comment on volumes: VLLW and LA-LLW soil and rubble arising from LETP Land remediation. Volumes updated for 2016 RWI to reflect SMART Inventory Review. This waste was originally part of 5C300 but this has been split to provide greater clarity.

Uncertainty factors on volumes:

Stock (upper):	x	Arisings (upper)	x 1.75
Stock (lower):	x	Arisings (lower)	x 0.25

WASTE SOURCE -

PHYSICAL CHARACTERISTICS

General description: Predominantly soil. There should be no large items in this waste stream. Land and buildings on the Harwell site, contaminated as a result of past operations.

Physical components (%wt): Metal ~1%, Soil ~82%; concrete/rubble, ~15%, plastics ~1%, other ~1%.

Sealed sources: -

Bulk density (t/m³): ~1.35

Comment on density: Average density for soil.

CHEMICAL COMPOSITION

General description and components (%wt): Metal ~1%, Soil ~82%; concrete/rubble, ~15%, plastics ~1%, other ~1%.

Chemical state: -

Chemical form of radionuclides: -

Metals and alloys (%wt): There should be no sheet metal or bulk metal items present in the waste stream.

Stainless steel.....	NE	
Other ferrous metals.....	~1.0	Rebar and small pipework
Iron.....		
Aluminium.....	NE	
Beryllium.....	NE	
Cobalt.....		
Copper.....	NE	
Lead.....	NE	
Magnox/Magnesium.....	NE	
Nickel.....		
Titanium.....		
Uranium.....	NE	
Zinc.....	NE	
Zircaloy/Zirconium.....	NE	
Other metals.....	NE	

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Organics (%wt):	-	
	Total cellulosics	NE
	Paper, cotton	NE
	Wood	NE
	Halogenated plastics	~1.0
	Total non-halogenated plastics	NE
	Condensation polymers	NE
	Others	NE
	Organic ion exchange materials	NE
	Total rubber	NE
	Halogenated rubber	NE
	Non-halogenated rubber	NE
	Hydrocarbons	
	Oil or grease	
	Fuel	
	Asphalt/Tarmac (cont.coal tar)	
	Asphalt/Tarmac (no coal tar)	TR
	Bitumen	
	Others	
	Other organics	NE
Other materials (%wt):	-	
	Inorganic ion exchange materials.	NE
	Inorganic sludges and flocs	NE
	Soil	~~82.0
	Brick/Stone/Rubble	~~10.0
	Cementitious material	~~5.0
	Sand	
	Glass/Ceramics	NE
	Graphite	NE
	Desiccants/Catalysts	
	Asbestos	
	Non/low friable	
	Moderately friable	
	Highly friable	
	Free aqueous liquids	
	Free non-aqueous liquids	
	Powder/Ash	
Inorganic anions (%wt):	-	

Fluoride	NE
Chloride	NE
Iodide	NE
Cyanide	NE
Carbonate	NE
Nitrate	NE
Nitrite	NE
Phosphate	NE
Sulphate	NE
Sulphide	NE

Materials of interest for waste acceptance criteria: -

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	
Active particles	
Soluble solids as bulk chemical compounds	

Hazardous substances / non hazardous pollutants: -

Acrylamide	
Benzene	
Chlorinated solvents	
Formaldehyde	
Organometallics	
Phenol	
Styrene	
Tri-butyl phosphate	
Other organophosphates	
Vinyl chloride	
Arsenic	
Barium	
Boron	

Cadmium.....

Caesium.....

Selenium.....

Chromium.....

Molybdenum.....

Thallium.....

Tin.....

Vanadium.....

Mercury compounds..... TR

Others.....

Electronic Electrical Equipment (EEE)

EEE Type 1.....

EEE Type 2.....

EEE Type 3.....

EEE Type 4.....

EEE Type 5.....

Complexing agents (%wt):

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids……

Other organic complexants.....

Total complexing agents.....

TREATMENT, PACKAGING AND DISPOSAL

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	~0.15
None		~99.9

Comment on planned treatments: It is intended that the majority of this waste stream will be disposed of via controlled burial to an off-site landfill, therefore no waste containers will be produced.

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Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	
Expected to be consigned to a Landfill Facility	99.9
Expected to be consigned to an On-Site Disposal Facility	
Expected to be consigned to an Incineration Facility	0.15
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): -

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

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Source:	Contamination as a result of past operations.
Uncertainty:	-
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:	Data taken from WCH - 1MXN-2HAR-0-WCH-V-4189 V13 decayed by one year.
Other information:	-

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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			1.59E-08	C C 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			1.63E-09	C C 2	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36				8	Lu 174				8
Ar 39				8	Lu 176				8
Ar 42				8	Hf 178n				8
K 40				8	Hf 182				8
Ca 41				8	Pt 193				8
Mn 53				8	Tl 204				8
Mn 54				8	Pb 205				8
Fe 55			7.4E-09	C C 2	Pb 210				8
Co 60				8	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			5.32E-09	C C 2	Po 210				8
Zn 65				8	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226			1.87E-09	C C 2
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90			1.9E-08	C C 2	Th 227				8
Zr 93				8	Th 228				8
Nb 91				8	Th 229				8
Nb 92				8	Th 230				8
Nb 93m				8	Th 232				8
Nb 94				8	Th 234			1.41E-09	C C 2
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99			1.13E-09	C C 2	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234				8
Ag 108m				8	U 235				8
Ag 110m				8	U 236				8
Cd 109				8	U 238			1.41E-09	C C 2
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238			1.89E-09	C C 2
Sn 123				8	Pu 239			5.79E-09	C C 2
Sn 126				8	Pu 240			5.79E-09	C C 2
Sb 125				8	Pu 241			6.53E-09	C C 2
Sb 126				8	Pu 242				8
Te 125m				8	Am 241			5.25E-09	C C 2
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134				8	Cm 242				8
Cs 135				8	Cm 243				8
Cs 137			4.63E-08	C C 2	Cm 244				8
Ba 133				8	Cm 245				8
La 137				8	Cm 246				8
La 138				8	Cm 248				8
Ce 144				8	Cf 249				8
Pm 145				8	Cf 250				8
Pm 147				8	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151				8	Other a				
Eu 152				8	Other b/g				
Eu 154				8	**Total a**	**0**		**2.2E-08**	**C C 2**
Eu 155				8	**Total b/g**	**0**		**1.05E-07**	**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