WASTE STREAM 5C334 Replacement Effluent Treatment Plant LLW

SITE Harwell

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	4.2 m³
Future arisings -	1.4.2019 - 31.3.2023.....	~20.8 m³
Total future arisings:		20.8 m³
Total waste volume:		25.0 m³

Comment on volumes: Arisings result from decommissioning operations on the site. Volumes updated for 2016 RWI to reflect SMART Inventory Review.

Uncertainty factors on volumes:

Stock (upper):	x 1.3	Arisings (upper)	x 1.3
Stock (lower):	x 0.7	Arisings (lower)	x 0.7

WASTE SOURCE Waste arising from the treatment of active effluent from site decommissioning. Waste will be processed through evaporators and encapsulated in Disposable Settling Tanks.

PHYSICAL CHARACTERISTICS

General description: Waste arising from the treatment of active effluent from site decommissioning. Waste will be processed through evaporators and encapsulated in Disposable Settling Tanks. Active effluent in Disposable Settling Tanks.

Physical components (%vol): Active effluent in Disposable Settling Tanks.

Sealed sources: -

Bulk density (t/m³): ~2

Comment on density: Based on density of similar waste stream.

CHEMICAL COMPOSITION

General description and components (%wt): Active effluent.

Chemical state: -

Chemical form of radionuclides: Ra: Present as a decay product of fuel.
U: Present as a metal or an oxide.
Pu: Present as metal, oxide or nitrate

Metals and alloys (%wt): -

Stainless steel.....	P
Other ferrous metals.....	~30.0
Iron.....	
Aluminium.....	P
Beryllium.....	
Cobalt.....	
Copper.....	P
Lead.....	P
Magnox/Magnesium.....	TR
Nickel.....	
Titanium.....	
Uranium.....	
Zinc.....	NE
Zircaloy/Zirconium.....	TR

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	Other metals	TR	Trace amounts of uranium metal may be present.
Organics (%wt):	-		
	Total cellulosics	10.0	
	Paper, cotton	P	
	Wood	~10.0	
	Halogenated plastics	P	PVC and PTFE
	Total non-halogenated plastics	0	
	Condensation polymers	0	
	Others	0	
	Organic ion exchange materials	0	
	Total rubber	P	
	Halogenated rubber	P	Hypalon and neoprene
	Non-halogenated rubber	P	
	Hydrocarbons		
	Oil or grease		
	Fuel		
	Asphalt/Tarmac (cont.coal tar)		
	Asphalt/Tarmac (no coal tar)		
	Bitumen		
	Others		
	Other organics	0	
Other materials (%wt):	-		
	Inorganic ion exchange materials.	NE	
	Inorganic sludges and flocs	NE	
	Soil	0	
	Brick/Stone/Rubble	P	
	Cementitious material	~55.0	
	Sand	~5.0	
	Glass/Ceramics	0	
	Graphite	0	
	Desiccants/Catalysts		
	Asbestos	0	
	Non/low friable		
	Moderately friable		
	Highly friable		
	Free aqueous liquids	0	
	Free non-aqueous liquids	0	
	Powder/Ash	0	
Inorganic anions (%wt):	Carbonates present in concrete.		

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Fluoride	0
Chloride	0
Iodide	0
Cyanide	0
Carbonate	P
Nitrate	0
Nitrite	0
Phosphate	0
Sulphate	0
Sulphide	0

Materials of interest for waste acceptance criteria: Trace amounts of uranium metal may be present.

Combustible metals	TR
Low flash point liquids	0
Explosive materials	0
Phosphorus	0
Hydrides	0
Biological etc. materials	0
Biodegradable materials	
Putrescible wastes	0
Non-putrescible wastes	
Corrosive materials	0
Pyrophoric materials	0
Generating toxic gases	0
Reacting with water	0
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.....

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..... NE

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		
None		100.0

Comment on planned treatments: -

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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 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	100.0

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 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	100.0	10	3

Other information: Disposal Settling Tanks inside ISO container.

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): The waste has a current WCH.

Waste consigned for disposal to LLWR in year of generation: No. Waste will be held in Disposal Settling Tanks until such time that the tank is full. At this point the DST will be disposed of to LLWR.

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: -

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RADIOACTIVITY

Source:	Activity in waste has arisen from the treatment of liquid effluent.
Uncertainty:	No data available for specific activities for the majority of the facility. Expected radionuclides listed above.
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 radionuclide fingerprint (future arisings only) for this waste stream has been updated using data from waste stream 5C39.
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	3.86E-06	C C 2	3.86E-06	C C 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14		8		8	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36		8		8	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54	1.19E-08	C C 2	1.19E-08	C C 2	Pb 205		8		8
Fe 55		8		8	Pb 210		8		8
Co 60	2.23E-05	C C 2	2.23E-05	C C 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63		8		8	Po 210		8		8
Zn 65	2.45E-08	C C 2	2.45E-08	C C 2	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226	1.42E-08	C C 2	1.42E-08	C C 2
Kr 85		8		8	Ra 228	9.97E-08	C C 2	9.97E-08	C C 2
Rb 87		8		8	Ac 227		8		8
Sr 90	3.31E-05	C C 2	3.31E-05	C C 2	Th 227		8		8
Zr 93		8		8	Th 228	4.09E-08	C C 2	4.09E-08	C C 2
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232	3.29E-07	C C 2	3.29E-07	C C 2
Nb 94		8		8	Th 234	3.14E-07	C C 2	3.14E-07	C C 2
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106	1.29E-07	C C 2	1.29E-07	C C 2	U 233		8		8
Pd 107		8		8	U 234	9.71E-08	C C 2	9.71E-08	C C 2
Ag 108m		8		8	U 235	2.37E-08	C C 2	2.37E-08	C C 2
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238	3.14E-07	C C 2	3.14E-07	C C 2
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	5.66E-07	C C 2	5.66E-07	C C 2
Sn 123		8		8	Pu 239	3.29E-06	C C 2	3.29E-06	C C 2
Sn 126		8		8	Pu 240	3E-07	C C 2	3E-07	C C 2
Sb 125		8		8	Pu 241	4.74E-05	C C 2	4.74E-05	C C 2
Sb 126		8		8	Pu 242		8		8
Te 125m		8		8	Am 241	5.6E-06	C C 2	5.6E-06	C C 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	1.74E-07	C C 2	1.74E-07	C C 2	Cm 242		8		8
Cs 135		8		8	Cm 243		8		8
Cs 137	5.2E-05	C C 2	5.2E-05	C C 2	Cm 244	1.53E-07	C C 2	1.53E-07	C C 2
Ba 133		8		8	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147		8		8	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152		8		8	Other b/g				
Eu 154	1.3E-06	C C 2	1.3E-06	C C 2	**Total a**	**1.07E-05**	**C C 2**	**1.07E-05**	**C C 2**
Eu 155	5.4E-07	C C 2	5.4E-07	C C 2	**Total b/g**	**1.61E-04**	**C C 2**	**1.61E-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