

WASTE STREAM	2F14	AGR Pond Furniture (Containers, Skips, Racks)
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SITE Sellafield
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Sellafield Limited
WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m ³
Future arisings -	1.4.2019 - 31.3.2022.....	0 m ³
	1.4.2022 - 31.3.2025.....	187.0 m ³
	1.4.2025 - 31.3.2026.....	86.0 m ³
	1.4.2026 - 31.3.2027.....	86.0 m ³
	1.4.2027 - 31.3.2028.....	119.0 m ³
	1.4.2028 - 31.3.2029.....	271.0 m ³
	1.4.2029 - 31.3.2030.....	271.0 m ³
	1.4.2030 - 31.3.2031.....	456.0 m ³
	1.4.2031 - 31.3.2032.....	271.0 m ³
	1.4.2032 - 31.3.2033.....	271.0 m ³
	1.4.2033 - 31.3.2034.....	271.0 m ³
	1.4.2034 - 31.3.2035.....	271.0 m ³
	1.4.2035 - 31.3.2036.....	271.0 m ³
	1.4.2036 - 31.3.2037.....	271.0 m ³
	1.4.2037 - 31.3.2038.....	271.0 m ³
	1.4.2038 - 31.3.2039.....	271.0 m ³
	1.4.2039 - 31.3.2040.....	276.0 m ³
	1.4.2040 - 31.3.2041.....	185.0 m ³
	1.4.2041 - 31.3.2042.....	85.0 m ³
	1.4.2042 - 31.3.2086.....	0 m ³
	1.4.2086 - 31.3.2087.....	720.0 m ³
	1.4.2087 - 31.3.2088.....	720.0 m ³
	1.4.2088 - 31.3.2089.....	720.0 m ³
	1.4.2089 - 31.3.2090.....	720.0 m ³
	1.4.2090 - 31.3.2091.....	720.0 m ³
	1.4.2091 - 31.3.2092.....	720.0 m ³
	1.4.2092 - 31.3.2093.....	720.0 m ³
	1.4.2093 - 31.3.2094.....	720.0 m ³
Total future arisings:		9950.0 m ³
Total waste volume:		9950.0 m ³

Comment on volumes: Arisings are a function of furniture removal as part of POCO activities and to support long-term storage business. Previous experience has demonstrated that this waste meets LLW through simply washing down with demineralised water. Volume is envelope volume of containers with skips inside, plus volume of 63e racks (which will replace containers/skips).

Uncertainty factors on volumes:
 Stock (upper): x Arisings (upper) x 1.1
 Stock (lower): x Arisings (lower) x 0.9

WASTE SOURCE Waste arises from storage of AGR fuel elements in ponds.

PHYSICAL CHARACTERISTICS

General description: The waste consists of metal containers and skips currently used for AGR buffer storage plus a small quantity of pond frames. There are also 63e racks which will replace the existing containers/skips and be used for interim storage of future AGR receipts. All waste items are large (e.g. container: 1.6mx1.6mx1.4m) and heavy 2-6te. The waste will not be generated until after 2022.

Physical components (%vol): Containers/skips (40%), 63e racks (58%), pond frames (2%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 0.9

Comment on density: The density is based on the average value for the two waste types: 1t/m³ for existing

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container/skip (based on envelope volume) and 0.8t/m³ for 63e racks.

CHEMICAL COMPOSITION

General description and components (%wt): Stainless steel (75%), concrete (15.5%), boronated stainless steel (9%), mild steel (0.5%).

Chemical state: Neutral

Chemical form of radionuclides: -

Metals and alloys (%wt): All sheet metal approx 1/4 inch thickness.

Stainless steel..... 75.0 304L.

Other ferrous metals..... ~0.50

Iron.....

Aluminium..... P

Beryllium..... 0

Cobalt..... 0

Copper.....

Lead..... 0

Magnox/Magnesium..... 0

Nickel.....

Titanium.....

Uranium..... 0

Zinc..... 0

Zircaloy/Zirconium..... 0

Other metals..... 9.0 Boronated stainless steel.

Organics (%wt): The waste contains no organic materials.

Total cellulose..... 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 0

 Fuel.....

 Asphalt/Tarmac (cont.coal tar)...

 Asphalt/Tarmac (no coal tar)....

 Bitumen.....

 Others.....

Other organics..... 0

Other materials (%wt): The skips will contain trace amounts of carbonaceous deposits, mostly graphite.

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	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs.....	TR
	Soil.....	0
	Brick/Stone/Rubble.....	0
	Cementitious material.....	15.5
	Sand.....	0
	Glass/Ceramics.....	
	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):	The listed anions are unlikely to be present.	
	Fluoride.....	0
	Chloride.....	0
	Iodide.....	0
	Cyanide.....	0
	Carbonate.....	0
	Nitrate.....	0
	Nitrite.....	0
	Phosphate.....	0
	Sulphate.....	0
	Sulphide.....	0

Materials of interest for waste acceptance criteria:

The recombimer material constitutes a very small proportion of the waste stream.

	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

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	Active particles.....	0
	Soluble solids as bulk chemical compounds.....	0
Hazardous substances / non hazardous pollutants:	Catalytic recombiners (Pt/Pd) are present in 170 of the skips (~10% of total waste stream). The weight is negligible compared with the weight of the skips.	
	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):	No	
	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 Recycling / reuse Other / various None		100.0

Comment on planned treatments:

Treatment and disposal plans are currently under development. Options being considered include on-site treatment (decontamination & size reduction) & disposal as LLW and consignment to an off-site metals treatment facility.

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: (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: -

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

Container voidage: -

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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

Source: The activity is a result of pond water contamination and carbonaceous deposits dislodged from the AGR fuel.

Uncertainty: Specific activities are based on measured samples with well defined measurement 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: Radiometric analysis of swabs taken from 4 containers was carried out and the activity measured for each was scaled up to the total surface area of the containers (and skips within). The average activity per container was based on the total for the 4 divided by the volume of the 4 containers.

Other information: -

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	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				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				
Mn 54			-7.30E-08	AA 1	Pb 205				
Fe 55					Pb 210				
Co 60			-7.10E-06	AA 1	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				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239		-3.80E-08	AA 1	
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
Te 127m					Am 242m				
I 129					Am 243				
Cs 134			-1.20E-07	AA 1	Cm 242				
Cs 135					Cm 243				
Cs 137			-5.50E-06	AA 1	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			2.30E-08	AA 1	Total a	0	3.80E-08	AA 1	
Eu 155					Total b/g	0	-1.28E-05	AA 1	

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