WASTE STREAM 9G109 Pond Scabbling Wastes

SITE	Trawsfynydd
SITE OWNER	Nuclear Decommissioning Authority
WASTE CUSTODIAN	Magnox Limited
WASTE TYPE	LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m³
Future arisings -	1.4.2019 - 31.3.2021.....	106.4 m³
Total future arisings:		106.4 m³
Total waste volume:		106.4 m³

Comment on volumes: The rate of arising of this stream will not be uniform over the period of Care and Maintenance Preparations. This waste is disposed of to the LLWR as soon as it is produced.

Uncertainty factors on volumes:

Stock (upper):	x	Arisings (upper)	x 1.2
Stock (lower):	x	Arisings (lower)	x 0.8

WASTE SOURCE Concrete wastes from scabbling of fuel ponds.

PHYSICAL CHARACTERISTICS

General description: Concrete that has been in contact with fuel pond water and with items held in the pond. There are no large items.

Physical components (%wt): Concrete (~70%wt), metal (~25%), plastic/rubber (~2%wt), wood (~2%) and others (including asbestos) (<1%).

Sealed sources: -

Bulk density (t/m³): ~2.1

Comment on density: WCH mass divided by volume

CHEMICAL COMPOSITION

General description and components (%wt): Concrete (~70%wt), metal (~25%), plastic/rubber (~2%wt), wood (~2%) and others (including asbestos) (<1%).

Chemical state: Alkali

Chemical form of radionuclides:
H-3: Any tritium is expected to be present as water, but some may be in the form of other inorganic compounds or as organic compounds.
C-14: Chemical form of carbon 14 has not been determined but may be graphite.
Cl-36: The chemical form of chlorine 36 has not been determined.
Se-79: The selenium content is insignificant.
Tc-99: The technetium content is insignificant.
Ra: Radium isotope content is insignificant.
Th: The thorium content is insignificant.
U: Chemical form of uranium has not been determined but may be uranium oxides.
Np: The neptunium content is insignificant.
Pu: Chemical form of plutonium has not been determined but may be plutonium oxides.

Metals and alloys (%wt): The scabbled concrete is loaded into mild steel boxes.

Stainless steel.....	4.7	Solid stainless steel- waste containers
Other ferrous metals.....	15.7	Solid mild steel- deplant waste
Iron.....	~0.90	Cast iron, solid metal
Aluminium.....	3.8	Operational waste-scaffolding
Beryllium.....		
Cobalt.....		
Copper.....		
Lead.....		
Magnox/Magnesium.....		

WASTE STREAM	9G109 Pond Scabbling Wastes		
	Nickel.....		
	Titanium.....		
	Uranium.....		
	Zinc.....		
	Zircaloy/Zirconium.....		
	Other metals.....		
Organics (%wt):	None expected.		
	Total cellulosics.....	2.0	
	Paper, cotton.....		
	Wood.....	2.0	
	Halogenated plastics		
	Total non-halogenated plastics.....	1.0	
	Condensation polymers.....		
	Others.....	1.0	Drum liners, plastic wrap
	Organic ion exchange materials....		
	Total rubber.....	1.0	
	Halogenated rubber	~0	
	Non-halogenated rubber.....	1.0	
	Hydrocarbons.....	<0.50	
	Oil or grease	<0.50	
	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.....	70.0	
	Sand.....		
	Glass/Ceramics.....		
	Graphite.....		
	Desiccants/Catalysts.....		
	Asbestos.....	<0.50	
	Non/low friable.....	<0.50	Fixed in cementatious matrix - chrysotile (white)
	Moderately friable.....	0	
	Highly friable.....	0	
	Free aqueous liquids.....		
	Free non-aqueous liquids.....		

WASTE STREAM	9G109	Pond Scabbling Wastes

Powder/Ash.....

Inorganic anions (%wt): Carbonates, phosphates, silicates and alumino-silicates are expected to be present in the waste but their % weight is not known.

Fluoride.....	NE
Chloride.....	NE
Iodide.....	NE
Cyanide.....	0
Carbonate.....	NE
Nitrate.....	NE
Nitrite.....	NE
Phosphate.....	NE
Sulphate.....	NE
Sulphide.....	NE

Materials of interest for waste acceptance criteria: Magnox metal is expected to be present but in such small quantities as to not pose a hazard.

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.....	P	4.8m2 Aluminium
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.....	

WASTE STREAM 9G109 Pond Scabbling Wastes

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..... 0

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)		
Incineration	Off-site	15.0
Solidification		
Decontamination		
Metal treatment	Off-site	8.0
Size reduction		
Decay storage		
Recyling / reuse		
Other / various		
None		77.0

Comment on planned treatments: 9.5% of this waste stream is expected to be sent to Landfill as VLLW.

WASTE STREAM 9G109 Pond Scabbling Wastes

Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	67.5
Expected to be consigned to a Landfill Facility	9.5
Expected to be consigned to an On-Site Disposal Facility	
Expected to be consigned to an Incineration Facility	15.0
Expected to be consigned to a Metal Treatment Facility	8.0
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	67.5	10	8
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: The scabbled concrete is placed into a mild steel box. This box is then placed into a HHISO container. About 18 of these mild steel boxes are placed into each HHISO.

Waste Planned for Disposal at the LLW Repository:

Container voidage: Significant in-accessible voidage is not expected.

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC). The waste has a current WCH.

Waste consigned for disposal to LLWR in year of generation: Yes. The waste is expected to be consigned for disposal in the 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: -

WASTE STREAM 9G109 Pond Scabbling Wastes

RADIOACTIVITY

Source:	Contamination of paint and concrete from walls and floors in the fuel ponds.
Uncertainty:	The values quoted were derived by calculation and are indicative of the activities that are expected.
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-3TRA-0-WCH-0-3870 decayed by two years for RWI 2019
Other information:	-

WASTE STREAM 9G109 Pond Scabbling Wastes

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			7.35E-08	C C 1	Gd 153				8
Be 10				8	Ho 163				8
C 14			1.38E-07	C C 1	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			3.96E-07	C C 1	Lu 174				8
Ar 39				8	Lu 176				8
Ar 42				8	Hf 178n				8
K 40			6.3E-08	C C 1	Hf 182				8
Ca 41				8	Pt 193				8
Mn 53				8	Tl 204				8
Mn 54				8	Pb 205				8
Fe 55			1.35E-08	C C 1	Pb 210				8
Co 60			3.65E-05	C C 1	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			1.22E-07	C C 1	Po 210				8
Zn 65				8	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226				8
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90			1.12E-03	C C 1	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			1.26E-07	C C 2
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99				8	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234			1.1E-07	C C 1
Ag 108m				8	U 235			1.58E-08	C C 1
Ag 110m				8	U 236			1.58E-08	C C 1
Cd 109				8	U 238			1.26E-07	C C 1
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238			4.3E-05	C C 1
Sn 123				8	Pu 239			1.28E-04	C C 1
Sn 126				8	Pu 240			1.28E-04	C C 1
Sb 125				8	Pu 241			1.42E-03	C C 1
Sb 126				8	Pu 242				8
Te 125m				8	Am 241			4.37E-04	C C 1
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134			2.13E-09	C C 1	Cm 242				8
Cs 135				8	Cm 243				8
Cs 137			1.59E-03	C C 1	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			1.18E-05	C C 1	**Total a**	**0**		**7.37E-04**	**C C 1**
Eu 155			1.09E-06	C C 1	**Total b/g**	**0**		**4.17E-03**	**C C 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