

WASTE STREAM**9J949****Pond and Effluent Treatment Plant LLW**

SITE Hunterston A
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Magnox Limited
WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m ³
Future arisings -	1.4.2019 - 31.3.2020.....	72.2 m ³
	1.4.2020 - 31.3.2021.....	138.5 m ³
	1.4.2021 - 31.3.2022.....	85.5 m ³
	1.4.2022 - 31.3.2023.....	41.5 m ³
Total future arisings:		337.6 m ³
Total waste volume:		337.6 m ³
Comment on volumes:	Waste volumes include a proportion of secondary waste arisings and contaminated soil.	
Uncertainty factors on volumes:	Stock (upper): x	Arisings (upper) x 1.2
	Stock (lower): x	Arisings (lower) x 0.8

WASTE SOURCE Waste arisings from Care & Maintenance Preparation of the ponds and Active Effluent Treatment Plant areas, also some contaminated soil.

PHYSICAL CHARACTERISTICS

General description: The waste includes pond wall scabbling waste, small redundant plant and tools and associated secondary waste, there is also some contaminated soil. There are no large items present which require special treatment. Includes some secondary waste.

Physical components (%wt): Metal (26%), Soil/rubble (22%), paper (3%wt), cloth (7%wt), filters and other plastics (38%), wood (3% wt) and other materials (asbestos) (~1%wt).

Sealed sources: -

Bulk density (t/m³): ~0.6

Comment on density: The mean waste density is approximately 0.6 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Metal (26%), Soil/rubble (22%), paper (3%wt), cloth (7%wt), filters and other plastics (38%), wood (3% wt) and other materials (asbestos) (~1%wt).

Chemical state: Neutral

Chemical form of radionuclides:
 H-3: Tritium may be present as tritiated water.
 C-14: Chemical form of carbon 14 may be graphite.
 Cl-36: The chemical form of chlorine 36 has not been determined.
 Se-79: The chemical form of selenium has not been determined.
 Tc-99: The chemical form of technetium has not been determined.
 Ra: The radium isotope content is insignificant.
 Th: The thorium content is insignificant.
 U: The chemical form of uranium isotopes has not been determined but may be uranium oxides.
 Np: Neptunium isotope content is expected to be insignificant.
 Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): Not fully assessed.

Stainless steel.....		
Other ferrous metals.....	25.6	Steel comprising of: 24.78% iron 0.35% nickel and 0.45 chromium
Iron.....		
Aluminium.....	0.22	Items e.g. shelving and brackets etc.
Beryllium.....		

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	Cobalt.....		
	Copper.....	0.11	Items e.g. pipework and fittings etc.
	Lead.....	0.08	Items e.g flashings and fittings etc.
	Magnox/Magnesium.....	0	
	Nickel.....		
	Titanium.....		
	Uranium.....		
	Zinc.....	NE	
	Zircaloy/Zirconium.....	0	
	Other metals.....	NE	"Other" metals have not been fully assessed.
Organics (%wt):	The waste contains cellulose in the form of paper and cloth and non-halogenated plastics as polythene. The proportions have not all been estimated. Some halogenated plastics and rubbers are expected.		
	Total cellulosics.....	~13.0	
	Paper, cotton.....	10.0	
	Wood.....	3.0	
	Halogenated plastics	NE	
	Total non-halogenated plastics.....	~38.0	
	Condensation polymers.....	0	
	Others.....	~38.0	Items e.g polythene, tanks, pipework, IBC's etc.
	Organic ion exchange materials....	0	
	Total rubber.....	NE	
	Halogenated rubber	NE	
	Non-halogenated rubber.....	NE	
	Hydrocarbons.....		
	Oil or grease	0.04	Grease, grease/oil contaminated rags
	Fuel.....		
	Asphalt/Tarmac (cont.coal tar)...		
	Asphalt/Tarmac (no coal tar)....		
	Bitumen.....		
	Others.....		
	Other organics.....	NE	
Other materials (%wt):	-		
	Inorganic ion exchange materials.	NE	
	Inorganic sludges and flocs.....	0	
	Soil.....	~1.0	
	Brick/Stone/Rubble.....	21.0	
	Cementitious material.....	0	
	Sand.....		
	Glass/Ceramics.....	0.01	Man made mineral fibre
	Graphite.....	NE	

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	Desiccants/Catalysts.....		
	Asbestos.....	0.03	
	Non/low friable.....	0.02	Chrysotile (white)
	Moderately friable.....	0.01	Chrysotile (white)
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....	0	
Inorganic anions (%wt):	No cyanides are expected, otherwise the inorganic anion content of waste is not estimated.		
	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:	Some asbestos is expected. Efforts are made to remove all hazardous materials from the waste during sorting.		
	Combustible metals.....	0	
	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.....	P	Surface area of Aluminium 2500000cm ² .
	Active particles.....		
	Soluble solids as bulk chemical compounds.....		
Hazardous substances / non hazardous pollutants:	-		
	Acrylamide.....		
	Benzene.....		
	Chlorinated solvents.....		
	Formaldehyde.....		

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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..... P

EEE Type 3..... P

EEE Type 4.....

EEE Type 5.....

4 of EEE Type 2: Plant items will include electric pumps and motors.

10 corded drills

Complexing agents (%wt):

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants.....

Total complexing agents..... NE

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	On-site	6.0
Supercompaction (HFC)	Off-site	6.0
Incineration	Off-site	10.0
Solidification		
Decontamination		
Metal treatment	Off-site	10.0
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		74.0

Comment on planned treatments:

54 % of this waste stream is expected to be sent to landfill as VLLW

Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	26.0
Expected to be consigned to a Landfill Facility	54.0
Expected to be consigned to an On-Site Disposal Facility	
Expected to be consigned to an Incineration Facility	10.0
Expected to be consigned to a Metal Treatment Facility	10.0
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 m ³	Number of packages
1/3 Height IP-1 ISO			
2/3 Height IP-2 ISO			
1/2 Height WAMAC IP-2 ISO	6.0	43.2	< 1
1/2 Height IP-2 Disposal/Re-usable ISO	20.0	7	10
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information:

43.2m³ loading volume is calculated based on the fact that you can low force compact two times the normal volume of waste into a 200 litre/0.2m³ drum (400 litres/0.4m³), you can then fit 36 drums (14.4m³) into a ½ height ISO, each drum can be super-compacted to a 1/3 of its original volume so therefore we can get 3 x the amount of un-compacted drums into the final disposal container (43.2m³).

Waste Planned for Disposal at the LLW Repository:

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Container voidage: It is not anticipated that there will be significant voidage inaccessible to grout.

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.

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: -

Uncertainty: Activity values are current best estimates. Specific activity is a function of Station operating history. The values quoted are indicative of the activities that would be 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: The specific activities have been estimated from the waste stream fingerprint compiled from the analysis of a number of waste samples for this stream. As per WCH: 1MXN-3HUA-0-WCH-0-4543 and decayed by 1 year from 1/4/2018-1/4/2019.

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			3.21E-07	CC 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			8.5E-08	CC 2	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			6.96E-08	CC 1	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			4.69E-08	CC 1	Pb 210				8
Co 60			9.56E-08	CC 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			2.29E-07	CC 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			9.86E-05	CC 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			3.62E-08	CC 2	Th 234		2.16E-08		8
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99			6.51E-08	CC 2	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234		2.21E-08	CC 1	
Ag 108m			9.37E-08	CC 2	U 235		2.55E-09	CC 1	
Ag 110m				8	U 236		3.53E-09	CC 1	
Cd 109				8	U 238		2.16E-08	CC 1	
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238		1.97E-06	CC 1	
Sn 123				8	Pu 239		1.73E-06	CC 1	
Sn 126				8	Pu 240		2E-06	CC 1	
Sb 125			1.24E-07	CC 2	Pu 241		4.09E-05	CC 1	
Sb 126				8	Pu 242				8
Te 125m			3.05E-08	8	Am 241		8.94E-06	CC 1	
Te 127m				8	Am 242m				8
I 129			1.22E-07	CC 1	Am 243				8
Cs 134			2.53E-08	CC 2	Cm 242				8
Cs 135				8	Cm 243		1.06E-08	CC 1	
Cs 137			7.56E-05	CC 2	Cm 244		1.73E-07	CC 1	
Ba 133			1.42E-07	CC 2	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			5.95E-08	CC 1	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151			9.43E-07	CC 2	Other a				
Eu 152			5.36E-07	CC 2	Other b/g				
Eu 154			3.14E-07	CC 2	Total a	0	1.49E-05	CC 2	
Eu 155			9.53E-08	CC 2	Total b/g	0	2.19E-04	CC 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