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| WASTE STREAM | 9H326 | Incinerator Building - LLW |
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SITE Wylfa
SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE LLW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

| | | Reported |
|------------------------|---------------------------|---------------------|
| Stocks: | At 1.4.2022..... | 0 m ³ |
| Future arisings - | 1.4.2101 - 31.3.2106..... | 65.4 m ³ |
| Total future arisings: | | 65.4 m ³ |
| Total waste volume: | | 65.4 m ³ |

Comment on volumes: Final Dismantling & Site Clearance is assumed to commence in 2097 with reactor dismantling commencing in 2101 and lasting for 5 years. The volumes and radioactivity have been calculated for 85 years after reactor shutdown, i.e. 2100. Waste has been deferred from C&M prep waste stream 9H929 to FSC.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.2
 Stock (lower): x Arisings (lower) x 0.8

WASTE SOURCE -

PHYSICAL CHARACTERISTICS

General description: -
 Physical components (%vol): Metal (96% vol), plastic (1% vol), glass (2% vol) and miscellaneous materials (1% vol). Types of metal have not yet been identified.
 Sealed sources: The waste does not contain sealed sources.
 Bulk density (t/m³): 1.4
 Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): -
 Chemical state: Neutral
 Chemical form of radionuclides: H-3: The chemical form of tritium has not been determined.
 C-14: The chemical form of carbon-14 has not been determined.
 Cl-36: Chemical form of chlorine 36 has not been determined.
 Se-79: The chemical form of selenium-79 has not been determined.
 Tc-99: The chemical form of technetium-99 has not been determined.
 Ra: The chemical form of radium isotopes have not been determined.
 Th: The chemical form of thorium isotopes have not been determined.
 U: The chemical form of uranium isotopes have not been determined.
 Np: The chemical form of neptunium isotopes have not been determined.
 Pu: The chemical form of plutonium isotopes have not been determined.

Metals and alloys (%wt): -

| | (%wt) | Type(s) / Grade(s) with proportions | % of total C14 activity |
|---------------------------|-------|-------------------------------------|-------------------------|
| Stainless steel..... | 0 | | |
| Other ferrous metals..... | 96.0 | | |
| Iron..... | | | |
| Aluminium..... | 0 | | |
| Beryllium..... | 0 | | |
| Cobalt..... | | | |

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|-------------------------|---|
| Copper..... | 0 |
| Lead..... | 0 |
| Magnox/Magnesium..... | 0 |
| Nickel..... | |
| Titanium..... | |
| Uranium..... | 0 |
| Zinc..... | 0 |
| Zircaloy/Zirconium..... | 0 |
| Other metals..... | 0 |

Organics (%wt): -

| | (%wt) | Type(s) and comment | % of total C14 activity |
|-------------------------------------|-------|---------------------|-------------------------|
| Total cellulose..... | 0 | | |
| Paper, cotton..... | 0 | | |
| Wood..... | 0 | | |
| Halogenated plastics | 1.0 | | |
| 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 | | | |
| Fuel..... | | | |
| Asphalt/Tarmac (cont.coal tar)... | | | |
| Asphalt/Tarmac (no coal tar).... | | | |
| Bitumen..... | | | |
| Others..... | | | |
| Other organics..... | 1.0 | | |

Other materials (%wt): -

| | (%wt) | Type(s) and comment | % of total C14 activity |
|------------------------------------|-------|---------------------|-------------------------|
| Inorganic ion exchange materials.. | 0 | | |
| Inorganic sludges and flocs..... | 0 | | |
| Soil..... | 0 | | |
| Brick/Stone/Rubble..... | 0 | | |
| Cementitious material..... | 0 | | |
| Sand..... | | | |
| Glass/Ceramics..... | 2.0 | | |
| Graphite..... | 0 | | |
| Desiccants/Catalysts..... | | | |

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| Asbestos..... | 0 |
| Non/low friable..... | |
| Moderately friable..... | |
| Highly friable..... | |
| Free aqueous liquids..... | 0 |
| Free non-aqueous liquids..... | 0 |
| Powder/Ash..... | 0 |

Inorganic anions (%wt): -

| | (%wt) | Type(s) and comment |
|----------------|-------|---------------------|
| 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: -

| | (%wt) | Type(s) and comment |
|------------------------------------------------|-------|---------------------|
| 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..... | 0 | |
| Higher activity particles..... | | |
| Soluble solids as bulk chemical compounds..... | | |

Hazardous substances / non hazardous pollutants: -

| | (%wt) | Type(s) and comment |
|-----------------|-------|---------------------|
| Acrylamide..... | | |

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Benzene.....
 Chlorinated solvents.....
 Formaldehyde.....
 Organometallics.....
 Phenol.....
 Styrene.....
 Tri-butyl phosphate.....
 Other organophosphates.....
 Vinyl chloride.....
 Arsenic.....
 Barium.....
 Boron.....
 Boron (in Boral).....
 Boron (non-Boral).....
 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):

| | (%wt) | Type(s) and comment |
|--------------------------------|-------|---------------------|
| EDTA..... | | |
| DPTA..... | | |
| NTA..... | | |
| Polycarboxylic acids..... | | |
| Other organic complexants..... | | |
| Total complexing agents..... | 0 | |

Potential for the waste to contain discrete items: Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs; All stainless items assumed DIs. NB if recycled then DI Limits n/a

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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:

-

Disposal Routes:

| Disposal Route | Stream volume % | Disposal density t/m3 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------|
| 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 | 1.4 |

Classification codes for waste expected to be consigned to a landfill facility: 17 04 05

Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):

| Disposal Route | Stream volume % | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|---------|
| | 2022/23 | 2023/24 | 2024/25 |
| 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 | | | |

Opportunities for alternative disposal routing: -

| Baseline Management Route | Opportunity Management Route | Stream volume (%) | Estimated Date that Opportunity will be realised | Opportunity Confidence | Comment |
|---------------------------|------------------------------|-------------------|--------------------------------------------------|------------------------|---------|
| - | - | - | - | - | - |

Waste Packaging for Disposal: (Not applicable to this waste stream)

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| 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: -

Waste Characterisation Form (WCH): -

Waste consigned for disposal to LLWR in year of generation: -

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: -

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: -

Other information: The activities quoted are those at 85 years after reactor shutdown, i.e. in 2100. There may be some contamination by Cs137.

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| Nuclide | Mean radioactivity, TBq/m ³ | | | | Nuclide | Mean radioactivity, TBq/m ³ | | | |
|---------|----------------------------------------|----------------|-----------------|----------------|------------------|----------------------------------------|-----------------|-----------------|----------------|
| | Waste at 1.4.2022 | Bands and Code | Future arisings | Bands and Code | | Waste at 1.4.2022 | Bands and Code | Future arisings | Bands and Code |
| H 3 | | | | 8 | Gd 153 | | | | 8 |
| Be 10 | | | | 8 | Ho 163 | | | | 8 |
| C 14 | | | 7.21E-05 | CC 2 | Ho 166m | | | | 8 |
| Na 22 | | | | 8 | Tm 170 | | | | 8 |
| Al 26 | | | | 8 | Tm 171 | | | | 8 |
| Cl 36 | | | 2.46E-05 | CC 2 | 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 | | | | 8 | Pb 210 | | | | 8 |
| Co 60 | | | 3.72E-09 | CC 2 | Bi 208 | | | | 8 |
| Ni 59 | | | | 8 | Bi 210m | | | | 8 |
| Ni 63 | | | 3.32E-05 | CC 2 | 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 | | | | 8 | 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 | | | 4.1E-07 | CC 2 | Th 234 | | 2.76E-09 | CC 2 | 8 |
| 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 | | 2.6E-09 | CC 2 | 8 |
| Ag 108m | | | 4.16E-07 | CC 2 | U 235 | | | | 8 |
| Ag 110m | | | | 8 | U 236 | | | | 8 |
| Cd 109 | | | | 8 | U 238 | | 2.76E-09 | CC 2 | 8 |
| Cd 113m | | | | 8 | Np 237 | | | | 8 |
| Sn 119m | | | | 8 | Pu 236 | | | | 8 |
| Sn 121m | | | | 8 | Pu 238 | | 6.54E-07 | CC 2 | 8 |
| Sn 123 | | | | 8 | Pu 239 | | 1.17E-06 | CC 2 | 8 |
| Sn 126 | | | | 8 | Pu 240 | | 1.52E-06 | CC 2 | 8 |
| Sb 125 | | | | 8 | Pu 241 | | 2.42E-06 | CC 2 | 8 |
| Sb 126 | | | | 8 | Pu 242 | | | | 8 |
| Te 125m | | | | 8 | Am 241 | | 6.53E-06 | CC 2 | 8 |
| 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 | | | 1.74E-05 | CC 2 | Cm 244 | | 4.61E-09 | CC 2 | 8 |
| Ba 133 | | | 1.81E-09 | 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 | | | | 8 | Cf 251 | | | | 8 |
| Sm 147 | | | | 8 | Cf 252 | | | | 8 |
| Sm 151 | | | | 8 | Other a | | | | 8 |
| Eu 152 | | | 1.39E-08 | CC 2 | Other b/g | | | | 8 |
| Eu 154 | | | 2.19E-09 | CC 2 | Total a | 0 | 9.88E-06 | CC 2 | 8 |
| Eu 155 | | | | 8 | Total b/g | 0 | 1.51E-04 | CC 2 | 8 |

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