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| WASTE STREAM | 9D106 | General Reactor LLW |
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SITE Hinkley Point A
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 - | 1.4.2037 - 31.3.2085..... | 96.0 m ³ |
| Total future arisings: | | 96.0 m ³ |
| Total waste volume: | | 96.0 m ³ |
| Comment on volumes: | Care & Maintenance is assumed to start in 2037 after Care & Maintenance Preparation has been completed. | |
| Uncertainty factors on volumes: | Stock (upper): x | Arisings (upper) x 1.2 |
| | Stock (lower): x | Arisings (lower) x 0.5 |

WASTE SOURCE Wastes from the general reactor area during the Care and Maintenance period.

PHYSICAL CHARACTERISTICS

General description: Principally mixed plastic sheeting and protective clothing all in mild steel drums. Any large items will be cut to fit standard packages.
 Physical components (%wt): Principally halogenated plastic (~20% wt), cotton (~50% wt), total rubber (~5%wt), all in mild steel drums (~25%wt).
 Sealed sources: The waste does not contain sealed sources.
 Bulk density (t/m³): ~0.4
 Comment on density: The density estimate may be subject to revision.

CHEMICAL COMPOSITION

General description and components (%wt): The waste comprises principally various plastics and cloth, all in mild steel drums.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Tritium present as surface contamination of waste by tritiated liquor.
 C-14: Carbon-14 may be in the form of graphite dust.
 Cl-36: Chlorine-36 may be present as a contaminant of graphite dust.
 Se-79: The selenium content is insignificant.
 Tc-99: The technetium content is insignificant.
 Ra: The radium isotope content is insignificant.
 Th: The thorium isotope content is insignificant.
 U: The uranium isotope content is insignificant.
 Np: The neptunium content is insignificant.
 Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): Bulk and sheet metal are not expected to be present in significant quantities and have not been assessed. Mild steel drums containing the waste will arise at about 10 per year.

| | (%wt) | Type(s) / Grade(s) with proportions | % of total C14 activity |
|---------------------------|-------|-------------------------------------|-------------------------|
| Stainless steel..... | 0 | | |
| Other ferrous metals..... | ~25.0 | | |
| Iron..... | | | |
| Aluminium..... | 0 | | |
| Beryllium..... | 0 | | |
| Cobalt..... | | | |

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|---------------------|--------------|----------------------------|
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|---------------------|--------------|----------------------------|

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

Organics (%wt): -

| | (%wt) | Type(s) and comment | % of total C14 activity |
|-------------------------------------|-------|---------------------|-------------------------|
| Total cellulose..... | ~50.0 | | |
| Paper, cotton..... | ~50.0 | | |
| Wood..... | NE | | |
| Halogenated plastics | ~20.0 | | |
| Total non-halogenated plastics..... | NE | | |
| Condensation polymers..... | NE | | |
| Others..... | NE | | |
| Organic ion exchange materials.... | 0 | | |
| Total rubber..... | ~5.0 | | |
| Halogenated rubber | ~3.0 | | |
| Non-halogenated rubber..... | ~2.0 | | |
| Hydrocarbons..... | | | |
| Oil or grease | | | |
| Fuel..... | | | |
| Asphalt/Tarmac (cont.coal tar)... | | | |
| Asphalt/Tarmac (no coal tar).... | | | |
| Bitumen..... | | | |
| Others..... | | | |
| Other organics..... | 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..... | NE | | |
| Graphite..... | 0 | | |
| Desiccants/Catalysts..... | | | |

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

Inorganic anions (%wt): None expected but possibly present in trace quantities.

| | (%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: None expected. Asbestos is not now expected to be present.

| | (%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: None expected.

| | (%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): Yes

| | (%wt) | Type(s) and comment |
|--------------------------------|-------|---|
| EDTA..... | | Traces of residual decontaminants may be present. |
| DPTA..... | | |
| NTA..... | | |
| Polycarboxylic acids..... | | |
| Other organic complexants..... | | |
| Total complexing agents..... | TR | |

Potential for the waste to contain discrete items: No.

WASTE STREAM 9D106 General Reactor LLW

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 | Off-site | 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 | 0.40 |

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

-

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)

WASTE STREAM 9D106 General Reactor LLW

| 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: Activation and contamination of materials.

Uncertainty: The values quoted are indicative of the activities that are expected. Activity values are current best estimates. Specific activity is a function of Station operating history.

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: Estimates have been made from the specific activity of stream 9D914. Derivation of activities from those of 9D914 to be confirmed. General Reactor LLW.

Other information: Activity estimates are as shown in the table.

WASTE STREAM 9D106 General Reactor LLW

| 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 | | | 8.71E-07 | CC 2 | Gd 153 | | | | 8 |
| Be 10 | | | | 8 | Ho 163 | | | | 8 |
| C 14 | | | 9.98E-08 | CC 2 | Ho 166m | | | | 8 |
| Na 22 | | | | 8 | Tm 170 | | | | 8 |
| Al 26 | | | | 8 | Tm 171 | | | | 8 |
| Cl 36 | | | 1E-07 | 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 | | | 2.77E-09 | CC 2 | Bi 208 | | | | 8 |
| Ni 59 | | | | 8 | Bi 210m | | | | 8 |
| Ni 63 | | | 6.86E-08 | 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 | | | | 8 | Th 234 | | | | 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 | | | | 8 |
| Ag 108m | | | | 8 | U 235 | | | | 8 |
| Ag 110m | | | | 8 | U 236 | | | | 8 |
| Cd 109 | | | | 8 | U 238 | | | | 8 |
| Cd 113m | | | | 8 | Np 237 | | | | 8 |
| Sn 119m | | | | 8 | Pu 236 | | | | 8 |
| Sn 121m | | | | 8 | Pu 238 | | | | 8 |
| Sn 123 | | | | 8 | Pu 239 | | | | 8 |
| Sn 126 | | | | 8 | Pu 240 | | | | 8 |
| Sb 125 | | | | 8 | Pu 241 | | 2.43E-06 | CC 2 | 8 |
| Sb 126 | | | | 8 | Pu 242 | | | | 8 |
| Te 125m | | | | 8 | Am 241 | | 2.26E-07 | 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 | | | 1.21E-09 | CC 2 | 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 | | | | 8 | Total a | 0 | 2.26E-07 | CC 2 | |
| Eu 155 | | | | 8 | Total b/g | 0 | 3.57E-06 | 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