

| WASTE STREAM | 2N14 | LLWR from PCM Operations for Metal Treatment |
|--------------|------|----------------------------------------------|
|--------------|------|----------------------------------------------|

**SITE** LLW Repository

**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Nuclear Waste Services (NWS)

**WASTE TYPE** LLW

**WASTE VOLUMES**

|                        | Reported (m <sup>3</sup> ) | OR | Conditioned (m <sup>3</sup> ) | Packaged (m <sup>3</sup> ) |
|------------------------|----------------------------|----|-------------------------------|----------------------------|
| Stocks:                | At 1.4.2025                |    |                               |                            |
| Future arisings:       |                            |    |                               |                            |
| Total future arisings: | 0.0                        |    |                               |                            |
| Total waste volume:    | 6.2                        |    |                               |                            |

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: No arisings as all waste has been generated.

Additional information on quantities: -

Uncertainty factors on volumes: Stock (upper): x 1.30 Arisings (upper): x -  
Stock (lower): x 0.70 Arisings (lower): x -

**WASTE SOURCE** The waste primarily comprises of metallic waste generated as part of decommissionign activities (Magazines).

**PHYSICAL CHARACTERISTICS**

General description: Metallic waste generated from decommissioning activities within the Magazines (including small plant components and larger items such as vent ductwork)

Changes since waste generated: The waste has not undergone any change since generated.

Bulk density (t/m<sup>3</sup>): ~ 0.60

Comment on density: Bulk density is based on an estimate of the total waste mass divided by the total waste volume.

**CHEMICAL COMPOSITION**

General description and components (%wt): Metallic waste stream (100%wt) ~ 19.13%wt stainless steel, ~75%wt other ferrous metals, ~5.78%wt aluminium, ~0.09%wt copper.

Chemical state: Alkali

Sheet metal proportion / thickness: The majority of metal will be steel (mild or stainless); the ventilation ductwork is zinc galvanised. Ventilation system ductwork sheets (~3mm thick) of galvanised steel (~6%wt). Items will vary in size and size reduction requirements will be influenced by the waste route.

Metals and alloys (%wt):

|                           | (%wt)  | Type(s) / Grades(s) with proportions           | % of total C14 activity |
|---------------------------|--------|------------------------------------------------|-------------------------|
| Stainless steel.....      | ~ 19.1 | Grades not known.                              |                         |
| Other ferrous metals..... | ~ 75.0 | Grades not known.                              |                         |
| Iron.....                 | -      | -                                              |                         |
| Aluminium.....            | ~ 5.8  | Grades not known.                              |                         |
| Beryllium.....            | -      | -                                              |                         |
| Cobalt.....               | -      | -                                              |                         |
| Copper.....               | ~ 0.09 | Predominantly in electrical equipment.         |                         |
| Lead.....                 | TR     | Trace could be present in redundant equipment. |                         |
| Magnox/Magnesium.....     | -      | -                                              |                         |
| Nickel.....               | TR     | Trace could be present in redundant equipment. |                         |
| Titanium.....             | -      | -                                              |                         |
| Uranium.....              | -      | -                                              |                         |
| Zinc.....                 | TR     | Trace could be present in redundant equipment. |                         |
| Zircaloy/Zirconium.....   | -      | -                                              |                         |
| Other metals.....         | -      | -                                              |                         |

Organics (%wt):

|                                     | (%wt) | Type(s) and comment | % of total C14 activity |
|-------------------------------------|-------|---------------------|-------------------------|
| Total cellulotics.....              | = 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.....                   | = 0   | -                   |                         |
| Oil or grease.....                  | = 0   | -                   |                         |
| Fuel.....                           | = 0   | -                   |                         |
| Asphalt/Tarmac (cont.coal tar)..... | = 0   | -                   |                         |
| Asphalt/Tarmac (no coal tar).....   | = 0   | -                   |                         |
| Bitumen.....                        | = 0   | -                   |                         |
| Others.....                         | = 0   | -                   |                         |
| 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.....                             | = 0   | -                   |                         |
| Glass/Ceramics.....                   | = 0   | -                   |                         |
| Graphite.....                         | = 0   | -                   |                         |
| Desiccants/Catalysts.....             | = 0   | -                   |                         |
| Asbestos.....                         | = 0   | -                   |                         |
| Non/low friable.....                  | = 0   | -                   |                         |
| Moderately friable.....               | = 0   | -                   |                         |
| Highly friable.....                   | = 0   | -                   |                         |
| Free aqueous liquids.....             | = 0   | -                   |                         |
| Free non-aqueous liquids.....         | = 0   | -                   |                         |
| Powder/Ash.....                       | = 0   | -                   |                         |

#### COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

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.....                   | = 0   | -                   |
| Putrescible wastes.....                        | = 0   | -                   |
| Non-putrescible wastes.....                    | = 0   | -                   |
| Corrosive materials.....                       | = 0   | -                   |
| Pyrophoric materials.....                      | = 0   | -                   |
| Generating toxic gases.....                    | = 0   | -                   |
| Reacting with water.....                       | = 0   | -                   |
| Higher activity particles.....                 | = 0   | -                   |
| Soluble solids as bulk chemical compounds..... | = 0   | -                   |

Hazardous substances / non hazardous pollutants: -

|                             | (%wt) | Type(s) and comment                                                                                              |
|-----------------------------|-------|------------------------------------------------------------------------------------------------------------------|
| Acrylamide.....             | = 0   | -                                                                                                                |
| Benzene.....                | = 0   | -                                                                                                                |
| Chlorinated solvents.....   | = 0   | -                                                                                                                |
| Formaldehyde.....           | = 0   | -                                                                                                                |
| Organometallics.....        | = 0   | -                                                                                                                |
| Phenol.....                 | = 0   | -                                                                                                                |
| Styrene.....                | = 0   | -                                                                                                                |
| Tri-butyl phosphate.....    | = 0   | Potentially present in hydraulic fluids but metallic items will be drained as much as is reasonably practicable. |
| Other organophosphates..... | = 0   | -                                                                                                                |
| Vinyl chloride.....         | = 0   | -                                                                                                                |
| Arsenic.....                | = 0   | -                                                                                                                |
| Barium.....                 | = 0   | -                                                                                                                |
| Boron.....                  | = 0   | -                                                                                                                |
| Boron (in Boral).....       | = 0   | -                                                                                                                |
| Boron (non-Boral).....      | = 0   | -                                                                                                                |
| Cadmium.....                | = 0   | -                                                                                                                |
| Caesium.....                | = 0   | -                                                                                                                |
| Selenium.....               | = 0   | -                                                                                                                |
| Chromium.....               | P     | Could be present in stainless steel alloy.                                                                       |
| Molybdenum.....             | P     | Could be present in stainless steel alloy.                                                                       |
| Thallium.....               | = 0   | -                                                                                                                |
| Tin.....                    | NE    | -                                                                                                                |
| Vanadium.....               | NE    | -                                                                                                                |
| Mercury compounds.....      | = 0   | -                                                                                                                |
| Others.....                 | = 0   | -                                                                                                                |

Complexing agents (%wt):

| No                             |       |                     |
|--------------------------------|-------|---------------------|
|                                | (%wt) | Type(s) and comment |
| EDTA.....                      | = 0   | -                   |
| DPTA.....                      | = 0   | -                   |
| NTA.....                       | = 0   | -                   |
| Polycarboxylic acids.....      |       | Not estimated       |
| Other organic complexants..... |       | Not estimated       |
| Total complexing agents.....   | = 0   | -                   |

Physical components:

|                                         | Number | Type(s) and comment |
|-----------------------------------------|--------|---------------------|
| Sources.....                            |        | -                   |
| Electronic & Electrical Equipment (EEE) |        | -                   |
| EEE Type 1.....                         |        | -                   |
| EEE Type 2.....                         |        | -                   |
| EEE Type 3.....                         |        | -                   |
| EEE Type 4.....                         |        | -                   |
| EEE Type 5.....                         |        | -                   |

TREATMENT, PACKAGING AND DISPOSAL

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

| Treatment                                                  | On-site / Off-site | Stream volume % |
|------------------------------------------------------------|--------------------|-----------------|
| Size reduction                                             | Off-site           | = 100.0         |
| Decay storage                                              |                    |                 |
| Low force compaction                                       |                    |                 |
| Supercompaction (HFC)                                      |                    |                 |
| Incineration                                               |                    |                 |
| Drying/dewatering/liquid separation                        |                    |                 |
| Tie down/fixatives/strippable coating/painting application |                    |                 |
| Decontamination                                            |                    |                 |
| Metal treatment                                            |                    |                 |
| Recycling / reuse                                          |                    |                 |
| Thermal treatment, including vitrification                 |                    |                 |
| Encapsulation                                              |                    |                 |
| Polymer encapsulation                                      |                    |                 |
| Other physical treatment                                   |                    |                 |
| Other chemical treatment                                   |                    |                 |
| Containerisation                                           |                    |                 |
| Treatment not yet determined                               |                    |                 |
| None                                                       |                    |                 |

Comments on planned treatments: -

Conditioning method: -

Conditioning plants:

| Plant Name | Location |
|------------|----------|
|            |          |

Likely conditioning matrix: -

Further information on the conditioning matrix: -

**Waste Packaging:**

|                        |           |                       |                    |              |                    |                                    |
|------------------------|-----------|-----------------------|--------------------|--------------|--------------------|------------------------------------|
| Likely container type: | Container | Waste packaged (vol%) | Waste loading (m³) | Payload (m³) | Number of packages | Estimated start date for packaging |
|                        | -         | -                     | -                  | -            | -                  | -                                  |

Range in container waste loading:

Other information on packaging and conditioning: Items that are exempt or SCO1 (exclusive use) under ADR will be shipped loose on a flatbed trailer for treatment.

Conditioned density (t/m³): -  
Conditioned density comment: -

**Management Routes:**

| Disposal Route                                                                     | Stream volume % | Raw density t/m³ | Start date |
|------------------------------------------------------------------------------------|-----------------|------------------|------------|
| Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland) | = 100.0         | ~ 0.60           | 2026       |
| Expected to be Non-NSD HAW managed under Scottish Government's policy              |                 |                  |            |
| Expected to be disposed to LLW Vaults NRS Dounreay                                 |                 |                  |            |
| Expected to be consigned to the Geological Disposal Facility                       |                 |                  |            |
| Expected to be consigned to a Near Surface Disposal Facility                       |                 |                  |            |
| Expected to be consigned to the LLW Repository                                     |                 |                  |            |
| Expected to be consigned to a Landfill Facility                                    |                 |                  |            |
| Expected to be disposed On-Site                                                    |                 |                  |            |
| Expected to be managed by In-Situ Disposal                                         |                 |                  |            |
| Expected to be consigned to an Incineration Facility                               |                 |                  |            |
| Expected to be consigned to a Metal Treatment Facility                             |                 |                  |            |
| Expected to be Out of Scope                                                        |                 |                  |            |
| Expected to be recycled / reused                                                   |                 |                  |            |
| Disposal route not known                                                           |                 |                  |            |

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

**Opportunities for alternative disposal routing:** No

| Baseline Management Route | Opportunity Management Route | Stream volume (%) | Opportunity Confidence | Comment |
|---------------------------|------------------------------|-------------------|------------------------|---------|
| -                         | -                            | -                 | -                      | -       |

**RADIOACTIVITY**

Source: Waste has become contaminated through contact with PCM waste stored / processed in the buildings.

Uncertainty: Specific activities have been based on sample results for waste items or similar waste items or inferred from monitoring data where available, but the majority of the waste volume is still to be characterised. Specific activities by mass have been converted to specific activities by volume, so uncertainties in the volume estimates will also be carried over.

Measurement of radioactivities: A number of characterisation methods have been used including; sampling, hand held monitoring. The majority of measurement data used has been collected prior to 2022.

Chemical form of radionuclides: H-3: Trace quantities could be present as organically bound or free tritium.  
C-14: Not expected to be present.  
Cl-36: Not expected to be present.  
Se-79: Not expected to be present.  
Tc-99: Not expected to be present.  
I-129: Not expected to be present.  
Ra: Could be present as metals, oxides or other forms.  
Th: Could be present as metals, oxides or other forms.  
U: Oxides, fluorides.  
Np: Could be present as metals, oxides or other forms.  
Pu: Nitrate, sulphide, fluoride or mixed oxides.

| WASTE STREAM 2N14 LLWR from PCM Operations for Metal Treatment |                            |                |                 |                |                  |                            |                |                 |                |
|----------------------------------------------------------------|----------------------------|----------------|-----------------|----------------|------------------|----------------------------|----------------|-----------------|----------------|
| Nuclide                                                        | Mean radioactivity, TBq/m³ |                |                 |                | Nuclide          | Mean radioactivity, TBq/m³ |                |                 |                |
|                                                                | Waste at 1.4.2025          | Bands and Code | Future Arisings | Bands and Code |                  | Waste at 1.4.2025          | Bands and Code | Future Arisings | Bands and Code |
| H 3                                                            |                            |                |                 |                | Gd 153           |                            |                |                 |                |
| Be 10                                                          |                            |                |                 |                | Ho 163           |                            |                |                 |                |
| C 14                                                           |                            |                |                 |                | 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                                                          |                            |                |                 |                | Pb 205           |                            |                |                 |                |
| Fe 55                                                          |                            |                |                 |                | Pb 210           |                            |                |                 |                |
| Co 60                                                          |                            |                |                 |                | 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            | ~ 1.51E-07                 | B B 2          |                 |                |
| Ag 108m                                                        |                            |                |                 |                | U 235            | ~ 9.88E-09                 | B B 2          |                 |                |
| Ag 110m                                                        |                            |                |                 |                | U 236            | ~ 1.41E-09                 | B B 2          |                 |                |
| Cd 109                                                         |                            |                |                 |                | U 238            | ~ 2.26E-08                 | B B 2          |                 |                |
| Cd 113m                                                        |                            |                |                 |                | Np 237           | ~ 2.82E-11                 | C C 2          |                 |                |
| Sn 119m                                                        |                            |                |                 |                | Pu 236           |                            |                |                 |                |
| Sn 121m                                                        |                            |                |                 |                | Pu 238           | ~ 1.34E-07                 | B B 2          |                 |                |
| Sn 123                                                         |                            |                |                 |                | Pu 239           | ~ 7.54E-06                 | B B 2          |                 |                |
| Sn 126                                                         |                            |                |                 |                | Pu 240           |                            |                |                 |                |
| Sb 125                                                         |                            |                |                 |                | Pu 241           | ~ 3.01E-06                 | B B 2          |                 |                |
| Sb 126                                                         |                            |                |                 |                | Pu 242           | ~ 2.82E-11                 | B B 2          |                 |                |
| Te 125m                                                        |                            |                |                 |                | Am 241           | ~ 2.27E-06                 | B B 2          |                 |                |
| Te 127m                                                        |                            |                |                 |                | Am 242m          |                            |                |                 |                |
| I 129                                                          |                            |                |                 |                | Am 243           |                            |                |                 |                |
| Cs 134                                                         |                            |                |                 |                | Cm 242           |                            |                |                 |                |
| Cs 135                                                         |                            |                |                 |                | Cm 243           |                            |                |                 |                |
| Cs 137                                                         | ~ 1.20E-08                 | C C 2          |                 |                | 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                                                         |                            |                |                 |                | Unsp a           |                            |                |                 |                |
| Eu 152                                                         |                            |                |                 |                | Unsp b/g         |                            |                |                 |                |
| Eu 154                                                         |                            |                |                 |                | <b>Total a</b>   | <b>1.01E-05</b>            | *              | <b>0</b>        | *              |
| Eu 155                                                         |                            |                |                 |                | <b>Total b/g</b> | <b>3.02E-06</b>            | *              | <b>0</b>        | *              |

#### 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 the 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  
\* Total calculated from the 114 declared radionuclides