

| WASTE STREAM | 5C331 | Minor Facilities Decommissioning VLLW and LA-LLW |
|--------------|-------|--------------------------------------------------|
|--------------|-------|--------------------------------------------------|

**SITE** Harwell

**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Nuclear Restoration Services Ltd (NRS)

**WASTE TYPE** VLLW

#### WASTE VOLUMES

|                        | Reported (m <sup>3</sup> ) | OR            | Conditioned (m <sup>3</sup> ) | Packaged (m <sup>3</sup> ) |
|------------------------|----------------------------|---------------|-------------------------------|----------------------------|
| Stocks:                | At 1.4.2025                | = 0           |                               |                            |
| Future arisings:       | 1.4.2025 - 31.3.2028       | 6465.5        |                               |                            |
| Total future arisings: |                            | <b>6465.5</b> |                               |                            |
| Total waste volume:    |                            | <b>6465.5</b> |                               |                            |

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

Comment on arising rates: Soil and rubble will arise as buildings are decommissioned.

Additional information on quantities: Volumes updated for 2016 RWI to reflect SMART Inventory Review. This waste was originally part of 5C300 but this has been split to provide greater clarity.

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 2.00  
Stock (lower): x - Arisings (lower): x 0.20

**WASTE SOURCE** -

#### PHYSICAL CHARACTERISTICS

General description: Solid miscellaneous legacy VLLW and LA-LLW resulting from various legacy decommissioning projects that occurred on the Harwell Site

Changes since waste generated: Minor Facility buildings on the Harwell site, contaminated as a result of past operations.

Bulk density (t/m<sup>3</sup>): ~ 0.69

Comment on density: -

#### CHEMICAL COMPOSITION

General description and components (%wt): Metal ~19%, concrete/rubble ~61%, soil ~16%, plastics ~3%, others ~1%

Chemical state: -

Sheet metal proportion / thickness: There should be no sheet metal or bulk metal items present in the waste stream.

Metals and alloys (%wt):

|                           | (%wt)  | Type(s) / Grades(s) with proportions | % of total C14 activity |
|---------------------------|--------|--------------------------------------|-------------------------|
| Stainless steel.....      | NE     | -                                    |                         |
| Other ferrous metals..... | ~ 7.0  | mild steel                           |                         |
| Iron.....                 | ~ 11.0 | Vent ducting                         |                         |
| Aluminium.....            | NE     | -                                    |                         |
| Beryllium.....            | NE     | -                                    |                         |
| Cobalt.....               | -      | -                                    |                         |
| Copper.....               | NE     | -                                    |                         |
| Lead.....                 | ~ 0.02 | Section lead pipe                    |                         |
| Magnox/Magnesium.....     | NE     | -                                    |                         |
| Nickel.....               | -      | -                                    |                         |
| Titanium.....             | -      | -                                    |                         |
| Uranium.....              | NE     | -                                    |                         |
| Zinc.....                 | ~ 0.10 | Vent ducting                         |                         |
| Zircaloy/Zirconium.....   | NE     | -                                    |                         |
| Other metals.....         | ~ 0.90 | undefined                            |                         |

Organics (%wt):

|                                     | (%wt) | Type(s) and comment                                                                      | % of total C14 activity |
|-------------------------------------|-------|------------------------------------------------------------------------------------------|-------------------------|
| Total cellulotics.....              | NE    | -                                                                                        |                         |
| Paper, cotton.....                  | NE    | -                                                                                        |                         |
| Wood.....                           | NE    | -                                                                                        |                         |
| Halogenated plastics.....           | TR    | -                                                                                        |                         |
| Total non-halogenated plastics..... | ~ 3.0 | -                                                                                        |                         |
| Condensation polymers.....          | ~ 1.5 | Secondary waste arisings i.e. soft waste which includes plastic wrap, poly sheeting, etc |                         |
| Others.....                         | ~ 1.5 | Secondary waste arisings i.e. soft waste which includes plastic wrap, poly sheeting, etc |                         |
| Organic ion exchange materials..... | NE    | -                                                                                        |                         |
| Total rubber.....                   | NE    | -                                                                                        |                         |
| Halogenated rubber.....             | NE    | -                                                                                        |                         |
| Non-halogenated rubber.....         | NE    | -                                                                                        |                         |
| Hydrocarbons.....                   | -     | -                                                                                        |                         |
| Oil or grease.....                  | -     | -                                                                                        |                         |
| Fuel.....                           | -     | -                                                                                        |                         |
| Asphalt/Tarmac (cont.coal tar)..... | -     | -                                                                                        |                         |
| Asphalt/Tarmac (no coal tar).....   | -     | -                                                                                        |                         |
| Bitumen.....                        | -     | -                                                                                        |                         |
| Others.....                         | -     | -                                                                                        |                         |
| Other organics.....                 | NE    | -                                                                                        |                         |

Other materials (%wt):

|                                       | (%wt)  | Type(s) and comment                                           | % of total C14 activity |
|---------------------------------------|--------|---------------------------------------------------------------|-------------------------|
| Inorganic ion exchange materials..... | NE     | -                                                             |                         |
| Inorganic sludges and flocs.....      | NE     | -                                                             |                         |
| Soil.....                             | ~ 16.0 | -                                                             |                         |
| Brick/Stone/Rubble.....               | ~ 61.0 | -                                                             |                         |
| Cementitious material.....            | -      | -                                                             |                         |
| Sand.....                             | -      | -                                                             |                         |
| Glass/Ceramics.....                   | NE     | -                                                             |                         |
| Graphite.....                         | NE     | -                                                             |                         |
| Desiccants/Catalysts.....             | -      | -                                                             |                         |
| Asbestos.....                         | ~ 0.05 | -                                                             |                         |
| Non/low friable.....                  | ~ 0.01 | Asbestos bound in mastic chrysotile (white)                   |                         |
| Moderately friable.....               | ~ 0.03 | Asbestos rope chrysotile (white)                              |                         |
| Highly friable.....                   | ~ 0.01 | Asbestos contamination on soft waste (PPE) chrysotile (white) |                         |
| Free aqueous liquids.....             | -      | -                                                             |                         |
| Free non-aqueous liquids.....         | -      | -                                                             |                         |
| Powder/Ash.....                       | -      | -                                                             |                         |

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

Inorganic anions (%wt):

|                | (%wt) | Type(s) and comment |
|----------------|-------|---------------------|
| Fluoride.....  | NE    | -                   |
| Chloride.....  | NE    | -                   |
| Iodide.....    | NE    | -                   |
| Cyanide.....   | NE    | -                   |
| Carbonate..... | NE    | -                   |
| Nitrate.....   | NE    | -                   |
| Nitrite.....   | NE    | -                   |
| Phosphate..... | NE    | -                   |
| Sulphate.....  | NE    | -                   |
| Sulphide.....  | NE    | -                   |

Materials of interest for waste acceptance criteria:

|                                                | (%wt) | Type(s) and comment |
|------------------------------------------------|-------|---------------------|
| Combustible metals.....                        |       | -                   |
| Low flash point liquids.....                   |       | -                   |
| Explosive materials.....                       |       | -                   |
| Phosphorus.....                                |       | -                   |
| Hydrides.....                                  |       | -                   |
| Biological etc. materials.....                 |       | -                   |
| Biodegradable materials.....                   | 0     | -                   |
| Putrescible wastes.....                        |       | -                   |
| Non-putrescible wastes.....                    |       | -                   |
| Corrosive materials.....                       |       | -                   |
| Pyrophoric materials.....                      |       | -                   |
| Generating toxic gases.....                    |       | -                   |
| Reacting with water.....                       |       | -                   |
| Higher activity particles.....                 |       | -                   |
| Soluble solids as bulk chemical compounds..... |       | -                   |

Hazardous substances / non hazardous pollutants:

|                             | (%wt) | Type(s) and comment |
|-----------------------------|-------|---------------------|
| Acrylamide.....             | 0     | -                   |
| 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.....                 |       | -                   |

Complexing agents (%wt):

| No                             |       |                     |
|--------------------------------|-------|---------------------|
|                                | (%wt) | Type(s) and comment |
| EDTA.....                      |       | -                   |
| DPTA.....                      |       | -                   |
| NTA.....                       |       | -                   |
| Polycarboxylic acids.....      |       | -                   |
| Other organic complexants..... |       | -                   |
| Total complexing agents.....   |       | -                   |

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                                             |                    |                 |
| 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                                                       |                    | = 100.0         |

Comments on planned treatments:

It is intended that the wastestream will be disposed of via controlled burial to an off-site landfill, therefore no waste containers will be produced.

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: -

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         | 0.69             |            |
| 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: 17 04 05, 15 02 02\*

Opportunities for alternative disposal routing: No

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

**RADIOACTIVITY**

Source: Contamination as a result of past operations.

Uncertainty: -

Measurement of radioactivities: -

Chemical form of radionuclides:

H-3: -  
C-14: -  
Cl-36: -  
Se-79: -  
Tc-99: -  
I-129: -  
Ra: -  
Th: -  
U: -  
Np: -  
Pu: -

| WASTE STREAM 5C331 Minor Facilities Decommissioning VLLW and LA-LLW |                            |                |                 |                |                  |                            |                |                 |                |
|---------------------------------------------------------------------|----------------------------|----------------|-----------------|----------------|------------------|----------------------------|----------------|-----------------|----------------|
| 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                                                                 |                            |                | 4.42E-08        | C C 1          | Gd 153           |                            |                |                 | 8              |
| Be 10                                                               |                            |                |                 | 8              | Ho 163           |                            |                |                 | 8              |
| C 14                                                                |                            |                | 4.55E-09        | C C 1          | Ho 166m          |                            |                |                 | 8              |
| Na 22                                                               |                            |                |                 | 8              | Tm 170           |                            |                |                 | 8              |
| Al 26                                                               |                            |                |                 | 8              | Tm 171           |                            |                |                 | 8              |
| Cl 36                                                               |                            |                |                 | 8              | Lu 174           |                            |                |                 | 8              |
| Ar 39                                                               |                            |                |                 | 8              | Lu 176           |                            |                |                 | 8              |
| Ar 42                                                               |                            |                |                 | 8              | Hf 178n          |                            |                |                 | 8              |
| K 40                                                                |                            |                |                 | 8              | Hf 182           |                            |                |                 | 8              |
| Ca 41                                                               |                            |                | 2.07E-09        | C C 2          | Pt 193           |                            |                |                 | 8              |
| Mn 53                                                               |                            |                |                 | 8              | Ti 204           |                            |                |                 | 8              |
| Mn 54                                                               |                            |                |                 | 8              | Pb 205           |                            |                |                 | 8              |
| Fe 55                                                               |                            |                |                 | 8              | Pb 210           |                            |                | 4.26E-09        | C C 2          |
| Co 60                                                               |                            |                |                 | 8              | Bi 208           |                            |                |                 | 8              |
| Ni 59                                                               |                            |                |                 | 8              | Bi 210m          |                            |                |                 | 8              |
| Ni 63                                                               |                            |                |                 | 8              | Po 210           |                            |                | 3.93E-09        | C C 2          |
| Zn 65                                                               |                            |                |                 | 8              | Ra 223           |                            |                |                 | 8              |
| Se 79                                                               |                            |                |                 | 8              | Ra 225           |                            |                |                 | 8              |
| Kr 81                                                               |                            |                |                 | 8              | Ra 226           |                            |                | 2.21E-08        | C C 2          |
| Kr 85                                                               |                            |                |                 | 8              | Ra 228           |                            |                | 2.91E-09        | C C 2          |
| Rb 87                                                               |                            |                |                 | 8              | Ac 227           |                            |                |                 | 8              |
| Sr 90                                                               |                            |                | 1.30E-08        | 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           |                            |                | 5.11E-09        | C C 1          |
| Nb 94                                                               |                            |                |                 | 8              | Th 234           |                            |                | 3.68E-08        | C C 1          |
| 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            |                            |                | 1.66E-09        | C C 1          |
| Ag 110m                                                             |                            |                |                 | 8              | U 236            |                            |                |                 | 8              |
| Cd 109                                                              |                            |                |                 | 8              | U 238            |                            |                | 3.68E-08        | C C 1          |
| Cd 113m                                                             |                            |                |                 | 8              | Np 237           |                            |                |                 | 8              |
| Sn 119m                                                             |                            |                |                 | 8              | Pu 236           |                            |                |                 | 8              |
| Sn 121m                                                             |                            |                |                 | 8              | Pu 238           |                            |                |                 | 8              |
| Sn 123                                                              |                            |                |                 | 8              | Pu 239           |                            |                | 8.00E-09        | C C 1          |
| Sn 126                                                              |                            |                |                 | 8              | Pu 240           |                            |                | 8.00E-09        | C C 1          |
| Sb 125                                                              |                            |                |                 | 8              | Pu 241           |                            |                | 1.42E-08        | C C 1          |
| Sb 126                                                              |                            |                |                 | 8              | Pu 242           |                            |                |                 | 8              |
| Te 125m                                                             |                            |                |                 | 8              | Am 241           |                            |                | 4.57E-09        | C C 2          |
| 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                                                              |                            |                | 5.20E-08        | C C 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              | Unsp a           |                            |                |                 |                |
| Eu 152                                                              |                            |                | 1.23E-08        | C C 2          | Unsp b/g         |                            |                |                 |                |
| Eu 154                                                              |                            |                |                 | 8              | <b>Total a</b>   | <b>0</b>                   | <b>*</b>       | <b>9.02E-08</b> | <b>*</b>       |
| Eu 155                                                              |                            |                |                 | 8              | <b>Total b/g</b> | <b>0</b>                   | <b>*</b>       | <b>1.86E-07</b> | <b>*</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