

| WASTE STREAM | 9H26/C | DSC4 Uranic Corrosion Debris |
|--------------|--------|------------------------------|
|--------------|--------|------------------------------|

**SITE** Wylfa

**SITE OWNER** Nuclear Decommissioning Authority

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

**WASTE TYPE** ILW

#### WASTE VOLUMES

Stocks:

Future arisings:

Total future arisings:

Total waste volume:

|             | Reported (m <sup>3</sup> ) |
|-------------|----------------------------|
| At 1.4.2025 |                            |
|             |                            |

OR

| Conditioned (m <sup>3</sup> ) | Packaged (m <sup>3</sup> ) |
|-------------------------------|----------------------------|
| = 0.3                         | 4.0                        |
|                               | 0.0                        |
|                               | 0.0                        |
| <b>0.0</b>                    | <b>0.0</b>                 |
| <b>0.3</b>                    | <b>4.0</b>                 |

Number of waste packages in stock: At 1.4.2025..... 3 packages

Comment on arising rates: -

Additional information on quantities: -

Uncertainty factors on volumes:

|                |        |                   |     |
|----------------|--------|-------------------|-----|
| Stock (upper): | x 1.00 | Arisings (upper): | x - |
| Stock (lower): | x 1.00 | Arisings (lower): | x - |

#### WASTE SOURCE

- 37 skip tubes containing various quantities of corrosion debris including one containing corroded uranic debris from half of a single fuel element (skip 131 tube D11)
  - Magnox alloy corrosion debris
  - Two lifting 'buttons' constructed of Magnox alloy MN150 and carbon insert.
- The waste also includes the tooling used to retrieve the skip-tubes.
- Miscellaneous contaminated mild steel (for the skip tubes).
  - Tooling is stainless steel.
  - Traces of oil (from tooling).

#### PHYSICAL CHARACTERISTICS

General description: Severely corroded uranium rod consisting of a mixture of corroded fuel element cladding, corroded fuel product (UO<sub>2</sub>) and surface corroded fuel pieces.

Changes since waste generated: -

Bulk density (t/m<sup>3</sup>): = 1.1

Comment on density: Bulk density of 1.095t/m<sup>3</sup>.

#### CHEMICAL COMPOSITION

General description and components (%wt): -

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

|                           | (%wt)  | Type(s) / Grades(s) with proportions | % of total C14 activity |
|---------------------------|--------|--------------------------------------|-------------------------|
| Stainless steel.....      | NE     | -                                    |                         |
| Other ferrous metals..... | ~ 96.0 | mild steel                           |                         |
| Iron.....                 | -      | -                                    |                         |
| Aluminium.....            | NE     | -                                    |                         |
| Beryllium.....            | NE     | -                                    |                         |
| Cobalt.....               | -      | -                                    |                         |
| Copper.....               | NE     | -                                    |                         |
| Lead.....                 | NE     | -                                    |                         |
| Magnox/Magnesium.....     | NE     | -                                    |                         |
| Nickel.....               | -      | -                                    |                         |
| Titanium.....             | -      | -                                    |                         |
| Uranium.....              | ~ 4.0  | Uranium corrosion product            |                         |
| Zinc.....                 | NE     | -                                    |                         |
| Zircaloy/Zirconium.....   | NE     | -                                    |                         |
| Other metals.....         | NE     | -                                    |                         |

Organics (%wt):

|                                     | (%wt) | Type(s) and comment | % of total C14 activity |
|-------------------------------------|-------|---------------------|-------------------------|
| Total cellulotics.....              | 0     | -                   |                         |
| Paper, cotton.....                  | -     | -                   |                         |
| Wood.....                           | -     | -                   |                         |
| Halogenated plastics.....           | -     | -                   |                         |
| Total non-halogenated plastics..... | 0     | -                   |                         |
| Condensation polymers.....          | -     | -                   |                         |
| Others.....                         | -     | -                   |                         |
| Organic ion exchange materials..... | = 0   | -                   |                         |
| Total rubber.....                   | 0     | -                   |                         |
| Halogenated rubber.....             | -     | -                   |                         |
| Non-halogenated rubber.....         | -     | -                   |                         |
| Hydrocarbons.....                   | -     | -                   |                         |
| Oil or grease.....                  | -     | -                   |                         |
| Fuel.....                           | -     | -                   |                         |
| Asphalt/Tarmac (cont.coal tar)..... | -     | -                   |                         |
| Asphalt/Tarmac (no coal tar).....   | -     | -                   |                         |
| Bitumen.....                        | -     | -                   |                         |
| Others.....                         | -     | -                   |                         |
| Other organics.....                 | -     | -                   |                         |

Other materials (%wt):

|                                       | (%wt) | Type(s) and comment | % of total C14 activity |
|---------------------------------------|-------|---------------------|-------------------------|
| Inorganic ion exchange materials..... | = 0   | -                   |                         |
| Inorganic sludges and flocs.....      | = 0   | -                   |                         |
| Soil.....                             | -     | -                   |                         |
| Brick/Stone/Rubble.....               | -     | -                   |                         |
| Cementitious material.....            | -     | -                   |                         |
| Sand.....                             | -     | -                   |                         |
| Glass/Ceramics.....                   | -     | -                   |                         |
| Graphite.....                         | -     | -                   |                         |
| Desiccants/Catalysts.....             | -     | -                   |                         |
| Asbestos.....                         | 0     | -                   |                         |
| Non/low friable.....                  | -     | -                   |                         |
| Moderately friable.....               | -     | -                   |                         |
| Highly friable.....                   | -     | -                   |                         |
| 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.....                        | NE    | -                   |
| Low flash point liquids.....                   | = 0   | -                   |
| Explosive materials.....                       | NE    | -                   |
| Phosphorus.....                                | NE    | -                   |
| Hydrides.....                                  | NE    | -                   |
| Biological etc. materials.....                 |       | -                   |
| Biodegradable materials.....                   | 0     | -                   |
| Putrescible wastes.....                        |       | -                   |
| Non-putrescible wastes.....                    |       | -                   |
| Corrosive materials.....                       | NE    | -                   |
| Pyrophoric materials.....                      | NE    | -                   |
| Generating toxic gases.....                    | NE    | -                   |
| Reacting with water.....                       | NE    | -                   |
| 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):

| Not yet determined             |       |                     |
|--------------------------------|-------|---------------------|
|                                | (%wt) | Type(s) and comment |
| EDTA.....                      |       | -                   |
| DPTA.....                      |       | -                   |
| NTA.....                       |       | -                   |
| Polycarboxylic acids.....      |       | -                   |
| Other organic complexants..... |       | -                   |
| Total complexing agents.....   | NE    | -                   |

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<br>Decay storage<br>Low force compaction<br>Supercompaction (HFC)<br>Incineration<br>Drying/dewatering/liquid separation<br>Tie down/fixatives/strippable coating/painting application<br>Decontamination<br>Metal treatment<br>Recycling / reuse<br>Thermal treatment, including vitrification<br>Encapsulation<br>Polymer encapsulation<br>Other physical treatment<br>Other chemical treatment<br>Containerisation<br>Treatment not yet determined<br>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 |
|-------------------------|-----------------------|--------------------|--------------|--------------------|------------------------------------|
| 500 l RS drum (20mm Pb) | 90.0                  | 0.14               | 0.14         | 2                  | -                                  |
| 500 l RS drum (0mm Pb)  | 10.0                  | 0.03               | 0.03         | 1                  | -                                  |

Range in container waste loading:

-

Other information on packaging and conditioning:

Due to the very dry (less than 30% relative humidity) long term storage conditions in DSC4, there was no need to condition the waste during the packaging process.

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           |                  |            |
| 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:

-

Uncertainty:

Activities calculated are considered to be upper bound estimates.

Measurement of radioactivities:

-

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.  
I-129: -  
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.

| WASTE STREAM |                            | 9H26/C            |                 | DSC4 Uranic Corrosion Debris |           |                            |                   |                 |                   |
|--------------|----------------------------|-------------------|-----------------|------------------------------|-----------|----------------------------|-------------------|-----------------|-------------------|
| Nuclide      | Mean radioactivity, TBq/m³ |                   |                 |                              | Nuclide   | Mean radioactivity, TBq/m³ |                   |                 |                   |
|              | Waste at<br>1.4.2025       | Bands and<br>Code | Future Arisings | Bands and<br>Code            |           | Waste at<br>1.4.2025       | Bands and<br>Code | Future Arisings | Bands and<br>Code |
| H 3          | 3.20E-01                   | A C 2             |                 |                              | Gd 153    |                            | 8                 |                 |                   |
| Be 10        | 2.28E-06                   | B C 2             |                 |                              | Ho 163    | 1.45E-04                   | B C 2             |                 |                   |
| C 14         | 3.88E-02                   | C C 2             |                 |                              | Ho 166m   | 4.40E-02                   | B C 2             |                 |                   |
| Na 22        |                            | 8                 |                 |                              | Tm 170    |                            | 8                 |                 |                   |
| Al 26        |                            | 8                 |                 |                              | Tm 171    | 3.30E-07                   | B C 2             |                 |                   |
| Cl 36        | 3.75E-03                   | C C 2             |                 |                              | Lu 174    | 5.36E-07                   | A C 2             |                 |                   |
| Ar 39        | 7.34E-03                   | B C 2             |                 |                              | Lu 176    |                            | 8                 |                 |                   |
| Ar 42        | 1.53E-08                   | C C 2             |                 |                              | Hf 178n   | 5.27E-02                   | B C 2             |                 |                   |
| K 40         | 4.45E-08                   | B C 2             |                 |                              | Hf 182    | 1.16E-08                   | C C 2             |                 |                   |
| Ca 41        | 2.03E-04                   | B C 2             |                 |                              | Pt 193    | 5.22E-04                   | B C 2             |                 |                   |
| Mn 53        |                            | 8                 |                 |                              | Tl 204    | 7.40E-05                   | A C 2             |                 |                   |
| Mn 54        |                            | 8                 |                 |                              | Pb 205    |                            | 8                 |                 |                   |
| Fe 55        | 3.93E-04                   | C C 2             |                 |                              | Pb 210    |                            | 8                 |                 |                   |
| Co 60        | 1.75E-02                   | C C 2             |                 |                              | Bi 208    |                            | 8                 |                 |                   |
| Ni 59        | 1.87E-03                   | B C 2             |                 |                              | Bi 210m   |                            | 8                 |                 |                   |
| Ni 63        | 5.15E-02                   | C C 2             |                 |                              | Po 210    |                            | 8                 |                 |                   |
| Zn 65        |                            | 8                 |                 |                              | Ra 223    | 1.19E-08                   | A C 2             |                 |                   |
| Se 79        | 1.51E-04                   | B C 2             |                 |                              | Ra 225    | 1.01E-08                   | A C 2             |                 |                   |
| Kr 81        | 1.55E-05                   | C C 2             |                 |                              | Ra 226    | 1.59E-09                   | A C 2             |                 |                   |
| Kr 85        | 2.18E+00                   | A C 2             |                 |                              | Ra 228    | 1.38E-09                   | A C 2             |                 |                   |
| Rb 87        | 1.65E-07                   | B C 2             |                 |                              | Ac 227    | 1.19E-08                   | A C 2             |                 |                   |
| Sr 90        | 6.62E+00                   | A C 2             |                 |                              | Th 227    | 1.17E-08                   | A C 2             |                 |                   |
| Zr 93        | 7.40E-03                   | B C 2             |                 |                              | Th 228    | 1.95E-06                   | A C 2             |                 |                   |
| Nb 91        | 1.45E-06                   | B C 2             |                 |                              | Th 229    | 1.01E-08                   | A C 2             |                 |                   |
| Nb 92        |                            | 8                 |                 |                              | Th 230    | 1.54E-07                   | A C 2             |                 |                   |
| Nb 93m       | 1.26E-02                   | B C 2             |                 |                              | Th 232    | 1.39E-09                   | A C 2             |                 |                   |
| Nb 94        | 1.76E-03                   | B C 2             |                 |                              | Th 234    | 3.97E-04                   | A C 2             |                 |                   |
| Mo 93        | 6.94E-06                   | A C 2             |                 |                              | Pa 231    | 1.83E-08                   | A C 2             |                 |                   |
| Tc 97        |                            | 8                 |                 |                              | Pa 233    | 4.09E-05                   | A C 2             |                 |                   |
| Tc 99        | 3.99E-03                   | A C 2             |                 |                              | U 232     | 1.89E-06                   | A C 2             |                 |                   |
| Ru 106       |                            | 8                 |                 |                              | U 233     | 2.31E-06                   | A C 2             |                 |                   |
| Pd 107       | 3.22E-05                   | A C 2             |                 |                              | U 234     | 3.32E-04                   | A C 2             |                 |                   |
| Ag 108m      | 6.92E-04                   | B C 2             |                 |                              | U 235     | 6.82E-06                   | A C 2             |                 |                   |
| Ag 110m      |                            | 8                 |                 |                              | U 236     | 5.44E-05                   | A C 2             |                 |                   |
| Cd 109       |                            | 8                 |                 |                              | U 238     | 3.97E-04                   | A C 2             |                 |                   |
| Cd 113m      | 9.11E-03                   | B C 2             |                 |                              | Np 237    | 4.10E-05                   | A C 2             |                 |                   |
| Sn 119m      |                            | 8                 |                 |                              | Pu 236    |                            | 8                 |                 |                   |
| Sn 121m      | 5.60E-02                   | B C 2             |                 |                              | Pu 238    | 1.67E-01                   | A C 2             |                 |                   |
| Sn 123       |                            | 8                 |                 |                              | Pu 239    | 1.94E-01                   | A C 2             |                 |                   |
| Sn 126       | 1.39E-03                   | C C 2             |                 |                              | Pu 240    | 3.11E-01                   | A C 2             |                 |                   |
| Sb 125       | 5.79E-05                   | A C 2             |                 |                              | Pu 241    | 4.15E+00                   | A C 2             |                 |                   |
| Sb 126       | 1.95E-04                   | A C 2             |                 |                              | Pu 242    | 3.30E-04                   | A C 2             |                 |                   |
| Te 125m      | 1.45E-05                   | A C 2             |                 |                              | Am 241    | 1.02E+00                   | A C 2             |                 |                   |
| Te 127m      |                            | 8                 |                 |                              | Am 242m   | 1.04E-03                   | A C 2             |                 |                   |
| I 129        | 9.10E-06                   | A C 2             |                 |                              | Am 243    | 1.21E-03                   | A C 2             |                 |                   |
| Cs 134       | 9.79E-06                   | A C 2             |                 |                              | Cm 242    | 8.53E-04                   | A C 2             |                 |                   |
| Cs 135       | 1.36E-04                   | A C 2             |                 |                              | Cm 243    | 4.81E-04                   | B C 2             |                 |                   |
| Cs 137       | 1.03E+01                   | A C 2             |                 |                              | Cm 244    | 1.11E-02                   | A C 2             |                 |                   |
| Ba 133       | 5.96E-04                   | A C 2             |                 |                              | Cm 245    | 1.74E-06                   | A C 2             |                 |                   |
| La 137       | 2.81E-07                   | A C 2             |                 |                              | Cm 246    | 2.16E-07                   | A C 2             |                 |                   |
| La 138       |                            | 8                 |                 |                              | Cm 248    |                            | 8                 |                 |                   |
| Ce 144       |                            | 8                 |                 |                              | Cf 249    |                            | 8                 |                 |                   |
| Pm 145       | 1.56E-07                   | A C 2             |                 |                              | Cf 250    |                            | 8                 |                 |                   |
| Pm 147       | 5.11E-04                   | A C 2             |                 |                              | Cf 251    |                            | 8                 |                 |                   |
| Sm 147       | 3.85E-08                   | B C 2             |                 |                              | Cf 252    |                            | 8                 |                 |                   |
| Sm 151       | 1.39E+00                   | B C 2             |                 |                              | Unsp a    |                            |                   |                 |                   |
| Eu 152       | 1.03E-03                   | B C 2             |                 |                              | Unsp b/g  | 1.16E-08                   |                   |                 |                   |
| Eu 154       | 3.45E-02                   | A C 2             |                 |                              | Total a   | 1.70E+00                   | *                 | 0               | *                 |
| Eu 155       | 1.21E-02                   | A C 2             |                 |                              | Total b/g | 2.53E+01                   | *                 | 0               | *                 |

#### 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