

WASTE STREAM**3J26****Miscellaneous Activated Components - Debris Vault 1****SITE** Dungeness B**SITE OWNER** EDFE NGL**WASTE CUSTODIAN** EDFE NGL**WASTE TYPE** ILW; SPD3**WASTE VOLUMES**

| | | Reported |
|------------------------|---------------------------|----------------------|
| Stocks: | At 1.4.2019..... | 93.5 m ³ |
| Future arisings - | 1.4.2019 - 31.3.2028..... | 32.4 m ³ |
| | 1.4.2028 - 31.3.2030..... | 32.5 m ³ |
| Total future arisings: | | 64.9 m ³ |
| Total waste volume: | | 158.4 m ³ |

Comment on volumes: Waste volumes will be variable depending on station operating conditions.

Uncertainty factors on volumes:

| | | | |
|----------------|--------|------------------|--------|
| Stock (upper): | x 1.25 | Arisings (upper) | x 1.75 |
| Stock (lower): | x 0.75 | Arisings (lower) | x 0.25 |

WASTE SOURCE Components resulting from the dismantling of fuel stringers.**PHYSICAL CHARACTERISTICS**

General description: Bottom support assemblies, bottom spacer assemblies and locking rings.

Physical components (%wt): Primarily expected to be steel. Some graphite may be present. Breakdown is not assessed.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~0.95

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Primarily expected to be Steel. Some graphite may be present. Breakdown is not assessed.

Chemical state: Neutral

Chemical form of radionuclides:

H-3: Diffused into materials
 C-14: Contamination by activated graphite
 Cl-36: Incorporated into steels
 Se-79: Not expected to be significant
 Tc-99: Not expected to be significant
 I-129: Not expected to be significant
 Ra: Not expected to be significant
 Th: Not expected to be significant
 U: Not expected to be significant
 Np: Not expected to be significant
 Pu: Not expected to be significant

Metals and alloys (%wt): -

| | |
|---------------------------|----|
| Stainless steel..... | P |
| Other ferrous metals..... | NE |
| Iron..... | NE |
| Aluminium..... | NE |
| Beryllium..... | NE |
| Cobalt..... | NE |
| Copper..... | NE |
| Lead..... | NE |
| Magnox/Magnesium..... | NE |
| Nickel..... | P |
| Titanium..... | NE |

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| | | |
|-------------------------|---|----|
| | Uranium..... | NE |
| | Zinc..... | NE |
| | Zircaloy/Zirconium..... | NE |
| | Other metals..... | NE |
| Organics (%wt): | To be further assessed. | |
| | Total cellulose..... | 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 | |
| | Fuel..... | |
| | Asphalt/Tarmac (cont.coal tar)... | |
| | Asphalt/Tarmac (no coal tar).... | |
| | Bitumen..... | |
| | Others..... | |
| | Other organics..... | NE |
| Other materials (%wt): | - | |
| | Inorganic ion exchange materials. | 0 |
| | Inorganic sludges and flocs..... | 0 |
| | Soil..... | 0 |
| | Brick/Stone/Rubble..... | 0 |
| | Cementitious material..... | 0 |
| | Sand..... | 0 |
| | Glass/Ceramics..... | |
| | Graphite..... | P |
| | Desiccants/Catalysts..... | 0 |
| | Asbestos..... | 0 |
| | Non/low friable..... | |
| | Moderately friable..... | |
| | Highly friable..... | |
| | Free aqueous liquids..... | 0 |
| | Free non-aqueous liquids..... | 0 |
| | Powder/Ash..... | 0 |
| Inorganic anions (%wt): | Not estimated, but are not expected to be present at greater than 1%wt. | |

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| | |
|----------------|----|
| 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:

None Expected.

| | |
|---|---|
| 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 |
| Active particles..... | P |
| Soluble solids as bulk chemical compounds..... | 0 |

Hazardous substances /
non hazardous pollutants:

| | |
|-----------------------------|----|
| - | |
| Acrylamide..... | NE |
| Benzene..... | NE |
| Chlorinated solvents..... | NE |
| Formaldehyde..... | NE |
| Organometallics..... | NE |
| Phenol..... | NE |
| Styrene..... | NE |
| Tri-butyl phosphate..... | NE |
| Other organophosphates..... | NE |
| Vinyl chloride..... | NE |
| Arsenic..... | NE |
| Barium..... | NE |
| Boron..... | NE |

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Cadmium..... NE
 Caesium..... NE
 Selenium..... NE
 Chromium..... NE
 Molybdenum..... NE
 Thallium..... NE
 Tin..... NE
 Vanadium..... NE
 Mercury compounds..... NE
 Others..... NE
 Electronic Electrical Equipment (EEE)
 EEE Type 1..... 0
 EEE Type 2..... 0
 EEE Type 3..... 0
 EEE Type 4..... 0
 EEE Type 5..... 0

Complexing agents (%wt):

Not yet determined

EDTA..... NE
 DPTA..... NE
 NTA..... NE
 Polycarboxylic acids..... NE
 Other organic complexants..... NE
 Total complexing agents..... NE

Expect only trace quantities, if any.

PACKAGING AND CONDITIONING

Conditioning method: The waste will be conditioned to satisfy the disposal requirements which are effective at the time of retrieval/conditioning. It is currently assumed that the waste will be placed in "baskets" in the waste packages and will be encapsulated.

Plant Name: None.

Location: Dungeness B Power Station.

Plant startup date: About 2113.

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m³/y incoming waste): -

Other information: All of the waste is expected to be retrieved and conditioned when a conditioning campaign is undertaken. The total plant process rate is not estimated.

Likely container type:

| Container | Waste packaged (%vol) | Waste loading (m ³) | Payload (m ³) | Number of packages |
|-----------------------------------|-----------------------|---------------------------------|---------------------------|--------------------|
| 4m box (100mm concrete shielding) | 100.0 | ~12.2 | ~14.3 | 13 |

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Likely container type comment: -

Range in container waste volume: -

Other information on containers: Stainless steel.

Likely conditioning matrix: BFS/OPC

Other information: -

Conditioned density (t/m³): ~3.0

Conditioned density comment: The density of the encapsulated waste is expected to be approximately 3 t/m³.

Other information on conditioning: Waste will be retained on site pending Final Site Clearance, to let nuclides such as Co-60 undergo considerable radioactive decay. Baskets of different Final Site Clearance ILW wastes may be in the same waste package.

Opportunities for alternative disposal routing: No

| Treatment | Stream volume (%) | Comment |
|-----------|-------------------|---------|
| - | - | - |

RADIOACTIVITY

Source: Components resulting from the dismantling of fuel stringers. Activation of nuclides within the graphite, steel and the Nimonic will be the main sources of activity.

Uncertainty: Specific activity is a function of station operating history. The values quoted are indicative of the activities that might be expected.

Definition of total alpha and total beta/gamma: Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.

Measurement of radioactivities: Theoretical assessments.

Other information: Estimates have been based on theoretical assessments. Other beta/gamma nuclides (in TBq/m³) expected in the arisings and stocks are: - S35 (1E-1, 1E-3); Ca45 (1E-1, 2E-3); Cr51 (2E+3, 8E-1); Co58 (2E+2, 1E+0); Sr89 (2E-6, 6E-9); Zr95 (4E-2, 2E-4); Nb95 (2E+0, 2E-3); Ta182 (1E-3, 1E-5); Sc46 (1E-2, 9E-5); Fe59 (3E+1, 7E-2); Sr85 (2E-6, 1E-8); Sn113 (9E-6, 1E-7) Sb124 (5E-8, 2E-10); Sm145 (5E-7, 3E-8) and W181 (5E-7, 8E-9).

WASTE STREAM

3J26

Miscellaneous Activated Components - Debris Vault 1

| Nuclide | Mean radioactivity, TBq/m ³ | | | | Nuclide | Mean radioactivity, TBq/m ³ | | | |
|---------|--|----------------|-----------------|----------------|------------------|--|----------------|------------------|----------------|
| | Waste at 1.4.2019 | Bands and Code | Future arisings | Bands and Code | | Waste at 1.4.2019 | Bands and Code | Future arisings | Bands and Code |
| H 3 | 7E-03 | DD 2 | 1E-02 | DD 2 | Gd 153 | | | | |
| Be 10 | 2E-07 | DD 2 | 2E-07 | DD 2 | Ho 163 | | | | |
| C 14 | 5E-02 | DD 2 | 5E-02 | DD 2 | Ho 166m | | | | |
| Na 22 | | 4 | | 4 | Tm 170 | | | | |
| Al 26 | | 4 | | 4 | Tm 171 | | | | |
| Cl 36 | 2E-05 | DD 2 | 2E-05 | DD 2 | Lu 174 | | | | |
| Ar 39 | | | | | Lu 176 | | | | |
| Ar 42 | | | | | Hf 178n | | | | |
| K 40 | | | | | Hf 182 | | | | |
| Ca 41 | 5E-05 | DD 2 | 5E-05 | DD 2 | Pt 193 | | | | |
| Mn 53 | | | | | Tl 204 | | | | |
| Mn 54 | 2E+00 | DD 2 | 5E+01 | DD 2 | Pb 205 | | | | |
| Fe 55 | 1E+02 | DD 2 | 5E+02 | DD 2 | Pb 210 | 8 | | 8 | |
| Co 60 | 2E+02 | DD 2 | 4E+02 | DD 2 | Bi 208 | | | | |
| Ni 59 | 5E-01 | DD 2 | 5E-01 | DD 2 | Bi 210m | | | | |
| Ni 63 | 5E+01 | DD 2 | 5E+01 | DD 2 | Po 210 | 8 | | 8 | |
| Zn 65 | 2E-05 | DD 2 | 4E-04 | DD 2 | Ra 223 | | | | |
| Se 79 | | 8 | | 8 | Ra 225 | | | | |
| Kr 81 | | | | | Ra 226 | 8 | | 8 | |
| Kr 85 | | | | | Ra 228 | | | | |
| Rb 87 | | | | | Ac 227 | | | | |
| Sr 90 | | 8 | | 8 | Th 227 | | | | |
| Zr 93 | 3E-07 | DD 2 | 3E-07 | DD 2 | Th 228 | | | | |
| Nb 91 | | | | | Th 229 | 8 | | 8 | |
| Nb 92 | | | | | Th 230 | 8 | | 8 | |
| Nb 93m | 4E-04 | DD 2 | 4E-04 | DD 2 | Th 232 | 8 | | 8 | |
| Nb 94 | 4E-02 | DD 2 | 4E-02 | DD 2 | Th 234 | | | | |
| Mo 93 | 5E-03 | DD 2 | 5E-03 | DD 2 | Pa 231 | 8 | | 8 | |
| Tc 97 | | | | | Pa 233 | | | | |
| Tc 99 | | 8 | | 8 | U 232 | | | | |
| Ru 106 | | 8 | | 8 | U 233 | 8 | | 8 | |
| Pd 107 | | 8 | | 8 | U 234 | 8 | | 8 | |
| Ag 108m | 3E-03 | DD 2 | 3E-03 | DD 2 | U 235 | 8 | | 8 | |
| Ag 110m | 2E-01 | DD 2 | 5E+00 | DD 2 | U 236 | 8 | | 8 | |
| Cd 109 | 7E-04 | DD 2 | 1E-02 | DD 2 | U 238 | 8 | | 8 | |
| Cd 113m | 4E-08 | DD 2 | 5E-08 | DD 2 | Np 237 | 8 | | 8 | |
| Sn 119m | 2E-08 | DD 2 | 4E-07 | DD 2 | Pu 236 | | | | |
| Sn 121m | | 8 | | 8 | Pu 238 | 8 | | 8 | |
| Sn 123 | 2E-07 | DD 2 | 9E-06 | DD 2 | Pu 239 | 8 | | 8 | |
| Sn 126 | | 8 | | 8 | Pu 240 | 8 | | 8 | |
| Sb 125 | | | | | Pu 241 | 8 | | 8 | |
| Sb 126 | | | | | Pu 242 | 8 | | 8 | |
| Te 125m | | | | | Am 241 | 8 | | 8 | |
| Te 127m | | | | | Am 242m | 8 | | 8 | |
| I 129 | | 8 | | 8 | Am 243 | 8 | | 8 | |
| Cs 134 | | 8 | | 8 | Cm 242 | 8 | | 8 | |
| Cs 135 | | 8 | | 8 | Cm 243 | 8 | | 8 | |
| Cs 137 | | 8 | | 8 | Cm 244 | 8 | | 8 | |
| Ba 133 | 7E-08 | DD 2 | 1E-07 | DD 2 | Cm 245 | 8 | | 8 | |
| La 137 | | | | | Cm 246 | 8 | | 8 | |
| La 138 | | | | | Cm 248 | | | | |
| Ce 144 | | 8 | | 8 | Cf 249 | | | | |
| Pm 145 | | | | | Cf 250 | | | | |
| Pm 147 | | 8 | | 8 | Cf 251 | | | | |
| Sm 147 | | | | | Cf 252 | | | | |
| Sm 151 | 2E-06 | DD 2 | 2E-06 | DD 2 | Other a | 8 | | 8 | |
| Eu 152 | 3E-03 | DD 2 | 4E-03 | DD 2 | Other b/g | 2E+00 | 2 | 2E+03 | 2 |
| Eu 154 | 8E-04 | DD 2 | 2E-03 | DD 2 | Total a | <1E-09 | 8 | <1E-09 | 8 |
| Eu 155 | 2E-04 | DD 2 | 4E-04 | DD 2 | Total b/g | 3.55E+02 | DD 2 | 3.01E+03 | DD 2 |

Bands (Upper and Lower)

- A a factor of 1.5
- B a factor of 3
- C a factor of 10
- D a factor of 100
- E a factor of 1000

Note: Bands quantify uncertainty in mean radioactivity.

Code

- 1 Measured activity
- 2 Derived activity (best estimate)
- 3 Derived activity (upper limit)
- 4 Not present
- 5 Present but not significant
- 6 Likely to be present but not assessed
- 7 Present in significant quantities but not determined
- 8 Not expected to be present in significant quantity