

<b>WASTE STREAM</b>	<b>3J27</b>	<b>Miscellaneous Activated Components &amp; Fuel Stringer Debris - Debris Vault 2</b>
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**SITE** Dungeness B

**SITE OWNER** EDFE NGL

**WASTE CUSTODIAN** EDFE NGL

**WASTE TYPE** ILW; SPD3

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	310.6m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2028.....	104.9m <sup>3</sup>
Total future arisings:		104.9m <sup>3</sup>
Total waste volume:		415.5m <sup>3</sup>
Comment on volumes:	Generation has ended and as such future arisings will be limited to those from defuelling.	
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** Graphite, stainless steel and nimonic components resulting from the dismantling of fuel stringers.

**PHYSICAL CHARACTERISTICS**

General description: Tie-bars, central inertial collectors (CICs), Spring Collet Assemblies, Graphite Sleeves, other items, including additional high activity components in steel tins, may also be present.

Physical components (%wt): Graphite items from the dismantling of fuel stringers, steel and nimonic. Breakdown is not assessed.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~0.95

Comment on density: -

**CHEMICAL COMPOSITION**

General description and components (%wt): Graphite items from the dismantling of fuel stringers, steel and nimonic. 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 Assessed  
Np: Not expected to be significant  
Pu: Not Assessed

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	P		
Other ferrous metals.....	NE		
Iron.....	NE		
Aluminium.....	NE		
Beryllium.....	NE		
Cobalt.....	NE		

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Debris - Debris Vault 2**

Copper.....	NE
Lead.....	NE
Magnox/Magnesium.....	NE
Nickel.....	P
Titanium.....	NE
Uranium.....	NE
Zinc.....	NE
Zircaloy/Zirconium.....	NE
Other metals.....	NE

Organics (%wt): To be further assessed.

	(%wt)	Type(s) and comment	% of total C14 activity
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): -

	(%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.....			
Graphite.....	P		
Desiccants/Catalysts.....	0		

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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.

	(%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:           Whilst it is difficult to ignite, graphite will eventually burn in air.

	(%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.....	P	
Soluble solids as bulk chemical compounds.....	0	

Hazardous substances / non hazardous pollutants:           -

	(%wt)	Type(s) and comment
Acrylamide.....	NE	

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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
Boron (in Boral).....	NE
Boron (non-Boral).....	NE
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
	(%wt)
EDTA.....	NE
DPTA.....	NE
NTA.....	NE
Polycarboxylic acids.....	NE
Other organic complexants.....	NE
Total complexing agents.....	TR

Type(s) and comment

Expect only trace quantities, if any.

Potential for the waste to contain discrete items: Yes.

**WASTE STREAM****3J27****Miscellaneous Activated Components & Fuel Stringer  
Debris - Debris Vault 2****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: 85 Years after Station Shutdown

Total capacity (m<sup>3</sup>/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m<sup>3</sup>/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 <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	4m box (100mm concrete shielding)	100.0	~12.2	~14.3	35

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/m<sup>3</sup>): ~3.0

Conditioned density comment: The density of the encapsulated waste is expected to be approximately 3 t/m<sup>3</sup>.

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

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	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'.

**WASTE STREAM****3J27****Miscellaneous Activated Components & Fuel Stringer  
Debris - Debris Vault 2**Measurement of  
radioactivities:

Theoretical assessments.

Other information:

Estimates have been based on theoretical assessments. Other beta/gamma nuclides (in TBq/m<sup>3</sup>) 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).

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	7E-03	CC 2	1E-02	CC 2	Gd 153				
Be 10	2E-07	CC 2	2E-07	CC 2	Ho 163				
C 14	5E-02	CC 2	5E-02	CC 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	2E-05	CC 2	2E-05	CC 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41	5E-05	CC 2	5E-05	CC 2	Pt 193				
Mn 53					Tl 204				
Mn 54	2E+00	CC 2	5E+01	CC 2	Pb 205				
Fe 55	1E+02	CC 2	5E+02	CC 2	Pb 210	8			8
Co 60	2E+02	CC 2	4E+02	CC 2	Bi 208				
Ni 59	5E-01	CC 2	5E-01	CC 2	Bi 210m				
Ni 63	5E+01	CC 2	5E+01	CC 2	Po 210	8			8
Zn 65	2E-05	CC 2	4E-04	CC 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	CC 2	3E-07	CC 2	Th 228				
Nb 91					Th 229	8			8
Nb 92					Th 230	8			8
Nb 93m	4E-04	CC 2	4E-04	CC 2	Th 232	8			8
Nb 94	4E-02	CC 2	4E-02	CC 2	Th 234				
Mo 93	5E-03	CC 2	5E-03	CC 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	CC 2	3E-03	CC 2	U 235	8			8
Ag 110m	2E-01	CC 2	5E+00	CC 2	U 236	8			8
Cd 109	7E-04	CC 2	1E-02	CC 2	U 238	8			8
Cd 113m	4E-08	CC 2	5E-08	CC 2	Np 237	8			8
Sn 119m	2E-08	CC 2	4E-07	CC 2	Pu 236				
Sn 121m		8		8	Pu 238	8			8
Sn 123	2E-07	CC 2	9E-06	CC 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	CC 2	1E-07	CC 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	CC 2	2E-06	CC 2	Other a	8			8
Eu 152	3E-03	CC 2	4E-03	CC 2	Other b/g	2E+00	2	2E+03	2
Eu 154	8E-04	CC 2	2E-03	CC 2	<b>Total a</b>	<b>&lt;1E-09</b>	<b>8</b>	<b>&lt;1E-09</b>	<b>8</b>
Eu 155	2E-04	CC 2	4E-04	CC 2	<b>Total b/g</b>	<b>3.55E+02</b>	<b>CC 2</b>	<b>3.01E+03</b>	<b>CC 2</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 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