

<b>WASTE STREAM</b>	<b>3K18</b>	<b>Pond Water Filtration Sludge</b>
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**SITE** Hartlepool

**SITE OWNER** EDFE NGL

**WASTE CUSTODIAN** EDFE NGL

**WASTE TYPE** ILW; SPD1

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	7.6 m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2023.....	0.2 m <sup>3</sup>
	1.4.2023 - 31.3.2024.....	0.2 m <sup>3</sup>
	1.4.2024 - 31.3.2025.....	0.2 m <sup>3</sup>
Total future arisings:		0.6 m <sup>3</sup>
Total waste volume:		8.2 m <sup>3</sup>
Comment on volumes:	Rates of arising are dependant on station operation. Volumes are expected to increase during defuelling.	
Uncertainty factors on volumes:	Stock (upper): x 1.5	Arisings (upper) x 1.5
	Stock (lower): x 0.5	Arisings (lower) x 0.5

**WASTE SOURCE** Filtration of pond water.

**PHYSICAL CHARACTERISTICS**

General description: Sludge, sand and filter precoat material. There are no large items that may require special handling.

Physical components (%wt): Sludge including filter sand and precoat material (100% vol), no other items identified. The breakdown of components constituting the sludge has not been fully assessed but in current stocks is about 17% wt cellulosic material (probably Solkafloc precoat) and 82.5% wt water with minor components constituting the other 0.5% wt.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~1

Comment on density: -

**CHEMICAL COMPOSITION**

General description and components (%wt): Current stocks are principally water and cellulosic material. Future arisings are to be determined. A wide variety of materials is expected but current stocks are about 17% wt cellulosic material (probably Solkafloc precoat) and 82.5% wt water with minor components constituting the other 0.5% wt.

Chemical state: Alkali

Chemical form of radionuclides:  
 H-3: Not yet determined  
 C-14: Not yet determined  
 Cl-36: Not yet determined  
 Se-79: Not yet determined  
 Tc-99: Not yet determined  
 I-129: Not yet determined  
 Ra: Not yet determined  
 Th: Not yet determined  
 U: Not yet determined  
 Np: Not yet determined  
 Pu: Not yet determined

Metals and alloys (%wt): None expected

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	NE		
Iron.....	NE		
Aluminium.....	NE		
Beryllium.....	NE		
Cobalt.....	NE		
Copper.....	NE		
Lead.....	NE		
Magnox/Magnesium.....	NE		
Nickel.....	NE		
Titanium.....	NE		
Uranium.....	NE		
Zinc.....	NE		
Zircaloy/Zirconium.....	NE		
Other metals.....	NE		

Organics (%wt): Oil and grease may be present. A little resin may be included in current stocks. About 99.5% wt of the waste is wet cellulosic - Solkafloc filter precoat.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~99.5		
Paper, cotton.....			
Wood.....			
Halogenated plastics .....	0		
Total non-halogenated plastics.....	0		
Condensation polymers.....	0		
Others.....	0		
Organic ion exchange materials....	NE		
Total rubber.....	0		
Halogenated rubber .....	0		
Non-halogenated rubber.....	0		
Hydrocarbons.....	NE		
Oil or grease .....			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	NE		

Other materials (%wt): -

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	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	~0.50		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....	NE		
Glass/Ceramics.....			
Graphite.....	0		
Desiccants/Catalysts.....	0		
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	P		
Free non-aqueous liquids.....	NE		
Powder/Ash.....	0		

Inorganic anions (%wt):            Estimate based upon analysis of current stocks.

	(%wt)	Type(s) and comment
Fluoride.....	0	
Chloride.....	~0.08	
Iodide.....	0	
Cyanide.....	0	
Carbonate.....	~0.70	
Nitrate.....	0	
Nitrite.....	0	
Phosphate.....	0	
Sulphate.....	~0.06	
Sulphide.....	0	

Materials of interest for waste acceptance criteria:            No material likely to represent a fire or other non-radiological hazard is expected to be present, but there may be some oil and grease and trace quantities of biological material.

	(%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	

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Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....	P	May be presesnt
Soluble solids as bulk chemical compounds.....	0	

Hazardous substances /  
non hazardous pollutants: -

	(%wt)	Type(s) and comment
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	
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	

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Complexing agents (%wt): Not yet determined

	(%wt)	Type(s) and comment
EDTA.....	NE	
DPTA.....	NE	
NTA.....	NE	
Polycarboxylic acids.....	NE	
Other organic complexants.....	NE	Trace quantities, if any.
Total complexing agents.....	NE	

Potential for the waste to contain discrete items: No.

**PACKAGING AND CONDITIONING**

Conditioning method: The waste is expected to be encapsulated in a BFS/OPC matrix. Another approach being kept under review is (i) to dry the sludge (ii) to supercompact drums of dry sludge (iii) to grout the supercompacted drums in an "enhanced" drum.

Plant Name: None.

Location: Hartlepool Power Station.

Plant startup date: Probably between 2029 and 2034.

Total capacity (m<sup>3</sup>/y incoming waste): ~175.0

Target start date for packaging this stream: -

Throughput for this stream (m<sup>3</sup>/y incoming waste): -

Other information: All waste in a tank will be retrieved when a conditioning campaign is undertaken. There may be more than one campaign.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	500 l drum	100.0	~0.33	0.47	25

Likely container type comment: -

Range in container waste volume: -

Other information on containers: Stainless Steel

Likely conditioning matrix: BFS/OPC

Other information: A 9:1 BFS/OPC matrix is expected to be used.

Conditioned density (t/m<sup>3</sup>): ~1.7

Conditioned density comment: The density range varies from 1.68 to 1.84 t/m<sup>3</sup>.

Other information on conditioning: Appropriate plant will be provided at the Station in accordance with EDF Energy strategy.

Opportunities for alternative disposal routing: No

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Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
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**RADIOACTIVITY**

Source:	Contaminated sludge. Contamination by activation products will be the main source of activity.
Uncertainty:	The values quoted for arisings were based on theoretical assessments, which assumed higher levels of activity than are anticipated during early operation. The arisings activities assume significant oxide spalling.
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 assessment and limited measurements.
Other information:	Other beta/gamma nuclides in arisings and stocks (in TBq/m <sup>3</sup> ) include: S35 (8E-8, 8E-10), Cr51 (1E+2, 4E-2), Co58 (5E+0, 3E-2), Sr89 (1E-7, 3E-10), Y91 (1E-6, 4E-9), Zr95 (4E-4, 2E-6), Nb95 (1E-3, 1E-6), Ru103 (4E-9, 6E-12), Ta182 (2E+0, 3E-2), Fe59 (2E-1, 5E-4) and Sb124 (6E-2, 3E-4).

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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	4.45E-03	CC 1	4.45E-03	CC 1	Gd 153				
Be 10					Ho 163				
C 14	3.44E-04	CC 1	3.44E-04	CC 1	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	4.12E-05	CC 1	4.12E-05	CC 1	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	1.57E-04	CC 1	1.57E-04	CC 1	Pb 205				
Fe 55	7.39E-03	CC 1	7.39E-03	CC 1	Pb 210				
Co 60	1.41E-03	CC 1	1.41E-03	CC 1	Bi 208				
Ni 59					Bi 210m				
Ni 63	1.60E-03	CC 1	1.60E-03	CC 1	Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	5.46E-05	CC 1	5.46E-05	CC 1	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	4.45E-05	CC 1	4.45E-05	CC 1
Sn 123					Pu 239	6.58E-05	CC 1	6.58E-05	CC 1
Sn 126					Pu 240	6.58E-05	CC 1	6.58E-05	CC 1
Sb 125					Pu 241	4.45E-03	CC 1	4.45E-03	CC 1
Sb 126					Pu 242				
Te 125m					Am 241	6.48E-04	CC 1	6.48E-04	CC 1
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	1.84E-05	CC 1	1.84E-05	CC 1	Cm 242				
Cs 135					Cm 243				
Cs 137	3.47E-03	CC 1	3.47E-03	CC 1	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147	9.21E-06	CC 1	9.21E-06	CC 1	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152					Other b/g	7.08E-07	CC 1	7.08E-07	CC 1
Eu 154	3.96E-05	CC 1	3.96E-05	CC 1	<b>Total a</b>	<b>8.24E-04</b>	<b>CC 1</b>	<b>8.24E-04</b>	<b>CC 1</b>
Eu 155	6.07E-06	CC 1	6.07E-06	CC 1	<b>Total b/g</b>	<b>2.34E-02</b>	<b>CC 1</b>	<b>2.34E-02</b>	<b>CC 1</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