

WASTE STREAM	3K18	Pond Water Filtration Sludge
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SITE Hartlepool

SITE OWNER EDFE NGL

WASTE CUSTODIAN EDFE NGL

WASTE TYPE ILW; SPD1

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	7.6 m ³
Future arisings -	1.4.2019 - 31.3.2024.....	0.5 m ³
	1.4.2024 - 31.3.2026.....	0.4 m ³
	1.4.2026 - 31.3.2027.....	2.9 m ³
Total future arisings:		3.8 m ³
Total waste volume:		11.4 m ³
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 ³):	~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
	Stainless steel..... NE
	Other ferrous metals..... NE
	Iron..... NE
	Aluminium..... NE
	Beryllium..... NE
	Cobalt..... NE

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	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.	
	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):	-	
	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.....	

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	Highly friable.....	
	Free aqueous liquids.....	P
	Free non-aqueous liquids.....	NE
	Powder/Ash.....	0
Inorganic anions (%wt):	Estimate based upon analysis of current stocks.	
	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.	
	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

May be present

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Other organophosphates.....	NE
Vinyl chloride.....	NE
Arsenic.....	NE
Barium.....	NE
Boron.....	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

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

Trace quantities, if any.

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 ³ /y incoming waste):	~175.0
Target start date for packaging this stream:	-
Throughput for this stream (m ³ /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.

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Likely container type:	Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
	500 l drum	100.0	~0.33	0.47	35

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/m³): ~1.7

Conditioned density comment: The density range varies from 1.68 to 1.84 t/m³.

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

Opportunities for alternative disposal routing: No

Treatment	Stream volume (%)	Comment
-	-	-

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/m³) 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 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		6	2E-05	C D 3	Gd 153				
Be 10		8		8	Ho 163				
C 14		8		8	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36		6		6	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41		8		8	Pt 193				
Mn 53					Tl 204				
Mn 54	2E-01	CC 2	5E+00	C D 2	Pb 205				
Fe 55		6	1E+01	C D 2	Pb 210		8		8
Co 60	1E-01	CC 2	1E+00	C D 2	Bi 208				
Ni 59		6	1E-02	C D 2	Bi 210m				
Ni 63		6	1E+00	C D 2	Po 210		8		8
Zn 65		8	1E-01	C D 2	Ra 223				
Se 79		8	1.21E-08	C D 2	Ra 225				
Kr 81					Ra 226		8		8
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90		6	2E-02	C D 2	Th 227				
Zr 93		8	6E-07	C D 2	Th 228				
Nb 91					Th 229		8		8
Nb 92					Th 230		8		8
Nb 93m		8		6	Th 232		8		8
Nb 94		8	1E-05	C D 2	Th 234				
Mo 93		8		8	Pa 231		8		8
Tc 97					Pa 233				
Tc 99		8	3E-06	C D 2	U 232				
Ru 106	<5E-04	C 3	1E-02	C D 2	U 233		8		8
Pd 107		8		8	U 234		8	2E-06	C D 2
Ag 108m		8		8	U 235		8	5E-08	C D 2
Ag 110m	<1E-03	C 3	3E-02	C D 2	U 236		8	4E-07	C D 2
Cd 109					U 238		8	7E-07	C D 2
Cd 113m					Np 237		8	3E-07	C D 2
Sn 119m					Pu 236				
Sn 121m		8		8	Pu 238	<2E-04	C 3	1E-03	C D 2
Sn 123					Pu 239	<7E-05	C 3	4E-04	C D 2
Sn 126		8	4.35E-08	C D 2	Pu 240	<1E-04	C 3	8E-04	C D 2
Sb 125			4E-03	C D 2	Pu 241		6	1E-01	C D 2
Sb 126					Pu 242		8	2E-06	C D 2
Te 125m					Am 241	2E-04	CC 2	7E-04	C D 2
Te 127m					Am 242m		6	1E-05	C D 2
I 129		8	5E-09	C D 2	Am 243		6	7E-06	C D 2
Cs 134	8E-04	CC 2	1E-02	C D 2	Cm 242	<1E-05	C 3	6E-04	C D 2
Cs 135		8	9E-08	C D 2	Cm 243	<2E-06	C 3	1E-05	C D 2
Cs 137	3E-03	CC 2	2E-02	C D 2	Cm 244	<6E-05	C 3	4E-04	C D 2
Ba 133	4E-07	CC 2			Cm 245		8		8
La 137					Cm 246		8		8
La 138					Cm 248				
Ce 144	3E-04	CC 2	9E-03	C D 2	Cf 249				
Pm 145					Cf 250				
Pm 147		6	2E-02	C D 2	Cf 251				
Sm 147					Cf 252				
Sm 151		6	2E-05	C D 2	Other a		8		8
Eu 152	2E-06	CC 2		6	Other b/g	1E-01	CC 2	1E+02	C D 2
Eu 154	8E-04	CC 2	6E-03	C D 2	Total a	<6.42E-04	C 3	3.92E-03	C D 2
Eu 155	5E-04	CC 2	4E-03	C D 2	Total b/g	4.07E-01	CC 2	1.17E+02	C D 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