

WASTE STREAM**3K02****Active Effluent Filtration Sludges****SITE** Hartlepool**SITE OWNER** EDFE NGL**WASTE CUSTODIAN** EDFE NGL**WASTE TYPE** LLW**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	45.8 m ³
Future arisings -	1.4.2019 - 31.3.2024.....	7.5 m ³
	1.4.2024 - 31.3.2026.....	6.0 m ³
	1.4.2026 - 31.3.2027.....	2.7 m ³
Total future arisings:		16.2 m ³
Total waste volume:		62.0 m ³

Comment on volumes: Arisings depend on station operation and are expected to increase during defuelling. Station operation is assumed to end in 2024 and defuelling to last 2 years.

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper) x 1.5
 Stock (lower): x 0.75 Arisings (lower) x 0.5

WASTE SOURCE Filtration of radioactive effluent.**PHYSICAL CHARACTERISTICS**

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

Physical components (%wt): Sludge (100% vol). The breakdown of components constituting the sludge may include dust, grit, sand, oil, paint, clay and plastic coalescers. Water may be about 65% wt of the waste.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1.6

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): A wide variety of materials including dust, grit, sand, oil, paint, clay and water. Water is expected to be about 65% wt. Wt% of other constituents has not been assessed.

Chemical state: Alkali

Chemical form of radionuclides: H-3: As tritiated water
 C-14: As graphite particulate or in activated metals
 Cl-36: Not determined
 Se-79: Not expected
 Tc-99: Not expected
 I-129: Not expected
 Ra: Not determined
 Th: Not determined
 U: Not determined
 Np: Not determined
 Pu: Not determined

Metals and alloys (%wt): -

Stainless steel.....	NE
Other ferrous metals.....	NE
Iron.....	NE
Aluminium.....	NE
Beryllium.....	NE
Cobalt.....	NE
Copper.....	NE
Lead.....	NE

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	Magnox/Magnesium.....	NE	
	Nickel.....	NE	
	Titanium.....	NE	
	Uranium.....	NE	
	Zinc.....	NE	
	Zircaloy/Zirconium.....	NE	
	Other metals.....	NE	Traces of lithium cations may be present from lithium hydroxide.
Organics (%wt):	Oil may be present at about 2%wt.		Plastics may be expected in trace quantities, if any.
	Total cellulosics.....	TR	
	Paper, cotton.....		
	Wood.....		
	Halogenated plastics	TR	
	Total non-halogenated plastics.....	TR	
	Condensation polymers.....		
	Others.....		
	Organic ion exchange materials....	NE	
	Total rubber.....	NE	
	Halogenated rubber	0	
	Non-halogenated rubber.....	0	
	Hydrocarbons.....		
	Oil or grease		
	Fuel.....		
	Asphalt/Tarmac (cont.coal tar)...		
	Asphalt/Tarmac (no coal tar)....		
	Bitumen.....		
	Others.....		
	Other organics.....	~2.0	
Other materials (%wt):	-		
	Inorganic ion exchange materials.	NE	
	Inorganic sludges and flocs.....	~98.0	
	Soil.....	NE	
	Brick/Stone/Rubble.....	NE	
	Cementitious material.....	NE	
	Sand.....	P	
	Glass/Ceramics.....	NE	
	Graphite.....	NE	
	Desiccants/Catalysts.....	NE	
	Asbestos.....	0	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	P	

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	Free non-aqueous liquids.....	P	
	Powder/Ash.....	0	
Inorganic anions (%wt):	Estimate based upon analysis of previous stocks consigned to the LLWR in 1992.		
	Fluoride.....	0	
	Chloride.....	<0.10	
	Iodide.....	0	
	Cyanide.....	0	
	Carbonate.....	<0.10	
	Nitrate.....	0	
	Nitrite.....	0	
	Phosphate.....	0	
	Sulphate.....	<0.10	
	Sulphide.....	0	
Materials of interest for waste acceptance criteria:	No material likely to represent a fire hazard or other non-radiological hazard has been identified.		
	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.....	NE	
	Corrosive materials.....	0	
	Pyrophoric materials.....	0	
	Generating toxic gases.....	0	
	Reacting with water.....	0	
	Active particles.....	0	Not expected
	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	

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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.....	TR

Expect only trace quantities, if any.

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction Supercompaction (HFC) Incineration Solidification Decontamination Metal treatment Size reduction Decay storage Recycling / reuse Other / various None	Off-site	100.0

Comment on planned treatments:

Waste is stored pending decommissioning stage 1. However, campaigns to retrieve the waste have occurred in the past with latest treatment by incineration.

WASTE STREAM**3K02****Active Effluent Filtration Sludges****Disposal Routes:**

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known	100.0

Upcoming (2019/20-2021/22) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known			

Waste Packaging for Disposal: (Not applicable to this waste stream)

Container	Stream volume %	Waste loading m ³	Number of packages
1/3 Height IP-1 ISO 2/3 Height IP-2 ISO 1/2 Height WAMAC IP-2 ISO 1/2 Height IP-2 Disposal/Re-usable ISO 2m box (no shielding) 4m box (no shielding) Other			

Other information: -

Waste Planned for Disposal at the LLW Repository: (Not applicable to this waste stream)

Container voidage: -

Waste Characterisation Form (WCH): -

Waste consigned for disposal to LLWR in year of generation: -

Potential for the waste to contain discrete items: -

Non-Containerised Waste for In-Vault Grouting: (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

RADIOACTIVITY

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Source:	Contaminated sludge. Contamination by activation products will be the main source of activity.
Uncertainty:	Specific activity is a function of station operating history. The values quoted are based upon activity measurements made on previously conditioned wastes.
Definition of total alpha and total beta/gamma:	Activity gross alpha and beta values quoted are from sample analysis report. Alpha value as Am241, gross beta as K-40.
Measurement of radioactivities:	Activity estimates are based on fingerprint of wastestream and on limited dose rate measurements and spectroscopic analysis.
Other information:	Other beta/gamma nuclides of arisings (in TBq/m ³) include Ca45 (3.8E-4), Cr51 (1.3E-6), Co58 (2.1E-6), Zr95 (9.0E-6), Nb95 (5.8E-6), Ru103 (9.0E-7), Ta182 (2.4E-7), Sc46 (8.0E-6), Fe59 (6.6e-7), Se75 (1.2E-5), Sb124 (7.8E-7) and Hg203 (2.0E-6).

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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	4.01E-04	CC 1	4.01E-04	CC 2	Gd 153				
Be 10					Ho 163				
C 14	2.24E-05	CC 1	2.24E-05	CC 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	<2.4E-08	C 1	<2.4E-08	C 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40	<7.8E-07	C 1	<7.8E-07	C 2	Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	3.1E-07	CC 1	3.1E-07	CC 2	Pb 205				
Fe 55	2.4E-06	CC 1	2.4E-06	CC 2	Pb 210	<3.8E-06	C 1	<3.8E-06	C 2
Co 60	2.31E-06	CC 1	2.31E-06	CC 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	5.4E-06	CC 1	5.4E-06	CC 2	Po 210				
Zn 65	<1.07E-07	C 1	<1.07E-07	C 2	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226	<1.12E-06	C 1	<1.12E-06	C 2
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	1.48E-06	CC 1	1.48E-06	CC 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	<2.5E-08	C 1	<2.5E-08	C 2	Th 234	<3.5E-07	C 1	<3.5E-07	C 2
Mo 93					Pa 231				
Tc 97					Pa 233	<6.4E-08	C 1	<6.4E-08	C 2
Tc 99					U 232				
Ru 106	<4.8E-07	C 1	<4.8E-07	C 2	U 233				
Pd 107					U 234	1.6E-08	CC 1	1.6E-08	CC 2
Ag 108m					U 235	<6.4E-08	C 1	<6.4E-08	C 2
Ag 110m	<3.5E-08	C 1	<3.5E-08	C 2	U 236	<2.1E-11	C 1	<2.1E-11	C 2
Cd 109					U 238	1.1E-08	CC 1	1.1E-08	CC 2
Cd 113m					Np 237	<2.7E-07	C 1	<2.7E-07	C 2
Sn 119m					Pu 236				
Sn 121m					Pu 238	3.1E-07	CC 1	3.1E-07	CC 2
Sn 123					Pu 239	5.8E-07	CC 1	5.8E-07	CC 2
Sn 126					Pu 240				
Sb 125	<1.76E-07	C 1	<1.76E-07	C 2	Pu 241				
Sb 126					Pu 242	<4E-09	C 3	<4E-09	C 3
Te 125m					Am 241	1.38E-06	CC 1	1.38E-06	CC 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	7.4E-08	CC 1	7.4E-08	CC 2	Cm 242	6.56E-09	CC 1	6.56E-09	CC 2
Cs 135					Cm 243	5.4E-08	CC 1	5.4E-08	CC 3
Cs 137	1.73E-05	CC 1	1.73E-05	CC 2	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	<1.49E-06	C 3	<1.49E-06	C 2	Cf 249				
Pm 145					Cf 250				
Pm 147	3.8E-06	CC 1	3.8E-06	CC 2	Cf 251				
Sm 147					Cf 252				
Sm 151	2.6E-07	CC 1	2.6E-07	CC 2	Other a	<1E-09	8	<1E-09	8
Eu 152	<5.8E-08	CC 1	<5.8E-08	CC 2	Other b/g	1.92E-07	CC 2	1.92E-07	CC 2
Eu 154	2.7E-07	CC 1	2.7E-07	CC 2	Total a	3.82E-06	CC 2	3.82E-06	CC 2
Eu 155	1.3E-07	CC 1	1.3E-07	CC 2	Total b/g	4.65E-04	CC 2	4.65E-04	CC 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