WASTE STREAM 4B14 Laundry LLW

SITE	Hunterston B
SITE OWNER	EDFE NGL
WASTE CUSTODIAN	EDFE NGL
WASTE TYPE	LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	16.2 m³
Future arisings -	1.4.2019 - 31.3.2023.....	100.0 m³
	1.4.2023 - 31.3.2025.....	50.0 m³
Total future arisings:		150.0 m³
Total waste volume:		166.2 m³

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 General trash.

PHYSICAL CHARACTERISTICS

General description: Paper, protective clothing (cloth, rubber), redundant plant (metal), etc. Some large items will be present i.e. redundant laundry equipment, which will be volume reduced by cutting, puncturing, etc.

Physical components (%wt): Metal (~5%), Soft Organics (~60%), Plastics/Rubber (~30%), Wood (~5%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~0.4

Comment on density: Waste density is estimated and is based on an average of the current waste arisings.

CHEMICAL COMPOSITION

General description and components (%wt): The waste comprises cloth, rubber, paper, plastics, metal and wood. The drum material is mild steel.

Chemical state: Neutral

Chemical form of radionuclides:
H-3: tritiated water
C-14: Activated graphite and metallic components
Cl-36: Not assessed
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): Some large items will be present i.e. redundant laundry equipment, which wil be volume reduced by cutting, puncturing, etc. prior to disposal.

Stainless steel.....	NE
Other ferrous metals.....	~5.0
Iron.....	TR
Aluminium.....	NE
Beryllium.....	NE
Cobalt.....	NE
Copper.....	NE
Lead.....	NE
Magnox/Magnesium.....	NE

WASTE STREAM	4B14	Laundry LLW

	Nickel	NE
	Titanium	NE
	Uranium	NE
	Zinc	NE
	Zircaloy/Zirconium	NE
	Other metals	NE
Organics (%wt):	The waste contains cellulose in the form of paper and cloth and non-halogenated plastic in the form of polythene.	
	Total cellulosics	~65.0
	Paper, cotton	~60.0
	Wood	~5.0
	Halogenated plastics	NE
	Total non-halogenated plastics	~20.0
	Condensation polymers	NE
	Others	<20.0
	Organic ion exchange materials	0
	Total rubber	~10.0
	Halogenated rubber	NE
	Non-halogenated rubber	<10.0
	Hydrocarbons	NE
	Oil or grease	NE
	Fuel	
	Asphalt/Tarmac (cont.coal tar)	
	Asphalt/Tarmac (no coal tar)	
	Bitumen	
	Others	
	Other organics	0
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	0
	Desiccants/Catalysts	0
	Asbestos	0
	Non/low friable	
	Moderately friable	
	Highly friable	
	Free aqueous liquids	0
	Free non-aqueous liquids	0

WASTE STREAM	4B14	Laundry LLW

	Powder/Ash..... 0	
Inorganic anions (%wt):	Inorganic anion content is not estimated.	
	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:	No hazardous materials in the waste as efforts are made to remove any hazardous materials during sorting and compaction.	
	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	
	Arsenic..... NE	

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

Complexing agents (%wt): Yes

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

Complexing agents are not estimated.

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)	Off-site	~10.0
Incineration	Off-site	~70.0
Solidification	Off-Site	<5.0
Decontamination		
Metal treatment	Off-Site	~10.0
Size reduction		
Decay storage		
Recyling / reuse		
Other / various		
None		~5.0

Comment on planned treatments: In line with the waste hierarchy, wastes will be treated preferentially by incineration, metal decontamination/melting, supercompaction, optimal packaging in HHISOs or immobilisation by encapsulation where necessary, prior to ultimate disposal at the LLW Repository. These treatments will be carried out off-site under contract with companies such as LLWR Ltd, EDF Cyclife, Tradebe and Inutec. The percentages are based on the history of consignments across the fleet of EDF Energy Nuclear Generation stations.

WASTE STREAM 4B14 Laundry LLW

Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	15.0
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	70.0
Expected to be consigned to a Metal Treatment Facility	10.0
Expected to be consigned as Out of Scope	
Expected to be recycled / reused	5.0
Disposal route not known	

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:

Container	Stream volume %	Waste loading m³	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	~15.0	~13.55	2
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: Waste loading is representative of the raw waste following further planned treatments. The waste will be reduced to 50% of its original waste volume after further planned treatments.

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC).
The waste does not have a current WCH.

Wastestream characterisation document is still currently valid.

Waste consigned for disposal to LLWR in year of generation: Yes. Waste will normally be disposed of during year of arising, but this is dependent on rate of arising throughout the year.

Potential for the waste to contain discrete items: Yes

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

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

WASTE STREAM 4B14 Laundry LLW

Inaccessible voidage:	-
Other information:	-

RADIOACTIVITY

Source:	Activity source is variable, but mainly activation products.
Uncertainty:	The estimate of specific activity is correct to a factor of 10.
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:	Based on waste stream characterisation .
Other information:	-

WASTE STREAM 4B14 Laundry LLW

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	1.34E-05	C C 2	1.34E-05	C C 2	Gd 153				
Be 10					Ho 163				
C 14	2.51E-06	C C 2	2.51E-06	C C 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	2.37E-06	C C 2	2.37E-06	C C 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	3.18E-07	C C 2	3.18E-07	C C 2	Pb 205				
Fe 55	3.86E-05	C C 2	3.86E-05	C C 2	Pb 210				
Co 60	1.37E-05	C C 2	1.37E-05	C C 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	8.52E-06	C C 2	8.52E-06	C C 2	Po 210				
Zn 65	8.56E-07	C C 2	8.56E-07	C C 2	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	7.47E-07	C C 2	7.47E-07	C C 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	5.42E-09	C C 2	5.42E-09	C C 2	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106	5.08E-08	C C 2	5.08E-08	C C 2	U 233				
Pd 107					U 234	9.58E-09	C C 2	9.58E-09	C C 2
Ag 108m	5.83E-09	C C 2	5.83E-09	C C 2	U 235	4.17E-10	C C 2	4.17E-10	C C 2
Ag 110m	5.42E-08	C C 2	5.42E-08	C C 2	U 236	3.33E-09	C C 2	3.33E-09	C C 2
Cd 109					U 238	9.58E-09	C C 2	9.58E-09	C C 2
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	4.17E-09	C C 2	4.17E-09	C C 2
Sn 123					Pu 239	2.08E-09	C C 2	2.08E-09	C C 2
Sn 126					Pu 240	5E-09	C C 2	5E-09	C C 2
Sb 125	1.29E-08	C C 2	1.29E-08	C C 2	Pu 241	5.81E-07	C C 2	5.81E-07	C C 2
Sb 126					Pu 242				
Te 125m					Am 241	1.29E-08	C C 2	1.29E-08	C C 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	1.58E-08	C C 2	1.58E-08	C C 2	Cm 242	3.75E-09	C C 2	3.75E-09	C C 2
Cs 135					Cm 243				
Cs 137	5.83E-07	C C 2	5.83E-07	C C 2	Cm 244	3.33E-09	C C 2	3.33E-09	C C 2
Ba 133	5E-09	C C 2	5E-09	C C 2	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	1.71E-08	C C 2	1.71E-08	C C 2	Cf 249				
Pm 145					Cf 250				
Pm 147	3.40E-07	C C 2	3.40E-07	C C 2	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a		6		6
Eu 152	1.17E-08	C C 2	1.17E-08	C C 2	Other b/g	1.65E-05	C C 2	1.65E-05	C C 2
Eu 154	1.42E-08	C C 2	1.42E-08	C C 2	**Total a**	**5.42E-08**	**C C 2**	**5.42E-08**	**C C 2**
Eu 155	9.17E-09	C C 2	9.17E-09	C C 2	**Total b/g**	**9.92E-05**	**C C 2**	**9.92E-05**	**C C 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