WASTE STREAM	9F18	Miscellaneous Drummed Contaminated and Activated Items

SITE Sizewell A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW; SPD3

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	90.0 m³
Total future arisings:		0 m³
Total waste volume:		90.0 m³

Comment on volumes: Station operation ended on December 31 2006. Almost all waste is expected to decay to LLW during the Care and Maintenance period.

Uncertainty factors on volumes:

Stock (upper):	x 1.2	Arisings (upper)	x
Stock (lower):	x 0.8	Arisings (lower)	x

WASTE SOURCE The waste is redundant equipment and material usually arising from reactor operation, irradiated fuel handling and pond operations.

PHYSICAL CHARACTERISTICS

General description: The majority of drummed waste is contained in 120 litre drums with a small percentage in 200 litre drums. There are no large items. Special handling requirements have not been assessed.

Physical components (%vol): Drummed non-combustible waste (100%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 0.4

Comment on density: The bulk density of the waste ranges from 0.2 t/m3 to 0.5 t/m3.

CHEMICAL COMPOSITION

General description and components (%wt): A mixture of non-combustible materials in 120-litre and 200-litre steel drums. All of the waste is non-combustible.

Chemical state: Neutral

Chemical form of radionuclides:
H-3: The chemical form of tritium may be water or other inorganic or organic compounds.
C-14: The chemical form of carbon 14 may be graphite.
Cl-36: The chemical form of chlorine 36 has not been determined.
Se-79: The selenium content is insignificant.
Tc-99: The technetium content is insignificant.
Ra: The radium isotope content is insignificant.
Th: The thorium isotope content is insignificant.
U: The chemical form of uranium isotopes has not been determined but may be uranium oxides.
Np: The neptunium content is insignificant.
Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): Metal is present as 120-litre and 200-litre mild steel drums of thickness ~1 mm.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~3.0	300 series stainless steels.	
Other ferrous metals.....	~90.0	Generally carbon steels.	
Iron.....			
Aluminium.....	<0.10		
Beryllium.....	0		
Cobalt.....			

WASTE STREAM	9F18	Miscellaneous Drummed Contaminated and Activated Items

Copper	<0.10	
Lead	<0.10	
Magnox/Magnesium	TR	Trace amounts of Magnox possible due to contamination with fuel.
Nickel	P	Chromium will be present as constituent of stainless steel.
Titanium		
Uranium		
Zinc	0	
Zircaloy/Zirconium	0	
Other metals	P	Nickel will be present as constituent of stainless steel. There are no "other" metals present.

Organics (%wt): Non-halogenated plastic present as polythene. There may be traces of oil and grease. Halogenated rubber present as viton and neoprene.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	0		
Paper, cotton	0		
Wood	0		
Halogenated plastics	0		
Total non-halogenated plastics	TR		
Condensation polymers	0		
Others	TR		
Organic ion exchange materials	0		
Total rubber	<0.10		
Halogenated rubber	<0.10	Viton and neoprene.	
Non-halogenated rubber	0		
Hydrocarbons			
Oil or grease			
Fuel			
Asphalt/Tarmac (cont.coal tar)			
Asphalt/Tarmac (no coal tar)			
Bitumen			
Others			
Other organics	TR		

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	~5.0		
Sand			
Glass/Ceramics	<0.10		

WASTE STREAM	9F18	Miscellaneous Drummed Contaminated and Activated Items

Graphite	0
Desiccants/Catalysts	
Asbestos	0
Non/low friable	
Moderately friable	
Highly friable	
Free aqueous liquids	0
Free non-aqueous liquids	TR
Powder/Ash	NE

Inorganic anions (%wt): Not fully assessed although it is recognised that carbonates will be present.

	(%wt)	Type(s) and comment
Fluoride	NE	
Chloride	NE	
Iodide	NE	
Cyanide	0	
Carbonate	NE	
Nitrate	NE	
Nitrite	NE	
Phosphate	NE	
Sulphate	NE	
Sulphide	NE	

Materials of interest for waste acceptance criteria: -

	(%wt)	Type(s) and comment
Combustible metals	TR	
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		
Corrosive materials	0	
Pyrophoric materials	0	
Generating toxic gases	0	
Reacting with water	TR	
Higher activity particles		
Soluble solids as bulk chemical compounds		

WASTE STREAM	9F18	Miscellaneous Drummed Contaminated and Activated Items

Hazardous substances / non hazardous pollutants: Of those listed only lead might be present, but in very small quantities, if any.

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		
Other organophosphates.....		
Vinyl chloride.....		
Arsenic.....		
Barium.....		
Boron.....	0	
Boron (in Boral).....		
Boron (non-Boral).....		
Cadmium.....		
Caesium.....		
Selenium.....		
Chromium.....		
Molybdenum.....		
Thallium.....		
Tin.....		
Vanadium.....		
Mercury compounds.....		
Others.....		
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

Complexing agents (%wt): No

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids…….		
Other organic complexants.....		
Total complexing agents.....	0	

WASTE STREAM	9F18	Miscellaneous Drummed Contaminated and Activated Items

Potential for the waste to contain discrete items: Yes. In & of itself not a DI; waste stream may include DIs (notably any stainless steel components)

TREATMENT, PACKAGING AND DISPOSAL

Waste that is currently ILW: The waste is expected to be LLW when retrieved.

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		
Recyling / reuse		
Other / various		
None		100.0

Comment on planned treatments: There may be an opportunity to segregate the waste for metal recycling and decontamination.

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	100.0	0.40
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		

Classification codes for waste expected to be consigned to a landfill facility: -

Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
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			

Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
Disposal at LLWR	Metal treatment	100.0	2092	Medium	There may be an opportunity to segregate the waste for metal recycling and decontamination at time of retrieval - currently assumed to be during FSC.
Disposal at LLWR	Disposal at a	NE	2030	Medium	It is intended to bring the scope for

Geological Disposal Facility	retrieval from the void forward into the Care and Maintenance Preparation phase, but this is not yet in the LTP baseline. This could have the effect of increasing the volume of waste needing to be processed as ILW.

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 2m box (no shielding) 4m box (no shielding) Other	100.0	10	9

Other information: It is intended to bring the scope for retrieval from the void forward into the Care and Maintenance Preparation phase, but this is not yet in the LTP baseline.

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

-

Waste consigned for disposal to LLWR in year of generation: No. The baseline position is for waste to be retrieved, monitored and disposed during Final Site Dismantling.

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

Source: Non-combustible wastes. Components that have been associated with fuel route operations are likely to be of high activity. Components will have become either contaminated or activated in use.

Uncertainty: The values quoted are indicative of the activities that are 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'.

Measurement of radioactivities: Activities have been calculated with assumptions of activation and contamination.

Other information: Specific activity is a function of Station operating history. Figures were derived by estimation based upon available information.

WASTE STREAM 9F18 Miscellaneous Drummed Contaminated and Activated Items

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	3.01E-04	C C 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	3.00E-05	C C 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	8E-05	C C 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	8.74E-06	C C 2			Pb 210		8		
Co 60	2.79E-05	C C 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	8.10E-05	C C 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79		8			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	2.79E-04	C C 2			Th 227		8		
Zr 93		8			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m		8			Th 232		8		
Nb 94		8			Th 234	2E-07	C C 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99		8			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	2E-07	C C 2		
Ag 108m		8			U 235	4E-09	C C 2		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	2E-07	C C 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	5.33E-06	C C 2		
Sn 123		8			Pu 239	1.00E-05	C C 2		
Sn 126		8			Pu 240	1.00E-05	C C 2		
Sb 125	2.04E-09	C C 2			Pu 241	1.46E-04	C C 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	3.44E-05	C C 2		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134	2.60E-08	C C 2			Cm 242		8		
Cs 135		8			Cm 243	1.41E-08	C C 2		
Cs 137	3.55E-04	C C 2			Cm 244	2.25E-07	C C 2		
Ba 133	2.61E-08	C C 2			Cm 245		8		
La 137		8			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	3.81E-08	C C 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152	1.39E-07	C C 2			Other b/g				
Eu 154	1.79E-07	C C 2			**Total a**	**6.04E-05**	**C C 2**	**0**	
Eu 155	3.59E-08	C C 2			**Total b/g**	**1.31E-03**	**C C 2**	**0**	

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