

WASTE STREAM	9F18	Miscellaneous Drummed Contaminated and Activated Items
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SITE Sizewell A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW; SPD3

WASTE VOLUMES

	Reported
Stocks: At 1.4.2019.....	90.0 m ³
Total future arisings:	0 m ³
Total waste volume:	90.0 m ³

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: -

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.

Stainless steel.....	~3.0	300 series stainless steels.
Other ferrous metals.....	~90.0	Generally carbon steels.
Iron.....		
Aluminium.....	<0.10	
Beryllium.....	0	
Cobalt.....		
Copper.....	<0.10	
Lead.....	<0.10	
Magnox/Magnesium.....	TR	Trace amounts of Magnox possible due to contamination

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with fuel.

Nickel..... P
 Titanium.....
 Uranium.....
 Zinc..... 0
 Zircaloy/Zirconium..... 0
 Other metals..... P

Chromium will be present as constituent of stainless steel.

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.

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
 Non-halogenated rubber..... 0
 Hydrocarbons.....
 Oil or grease
 Fuel.....
 Asphalt/Tarmac (cont.coal tar)...
 Asphalt/Tarmac (no coal tar)....
 Bitumen.....
 Others.....
 Other organics..... TR

viton and neoprene.

Other materials (%wt):

-
 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
 Graphite..... 0
 Desiccants/Catalysts.....
 Asbestos..... 0
 Non/low friable.....
 Moderately friable.....

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	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.	
	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:	-	
	Combustible metals.....	TR
	Low flash point liquids.....	0
	Explosive materials.....	0
	Phosphorus.....	0
	Hydrides.....	0
	Biological etc. materials.....	0
	Biodegradable materials.....	
	Putrescible wastes.....	0
	Non-putrescible wastes.....	
	Corrosive materials.....	0
	Pyrophoric materials.....	0
	Generating toxic gases.....	0
	Reacting with water.....	TR
	Active particles.....	
	Soluble solids as bulk chemical compounds.....	
Hazardous substances / non hazardous pollutants:	Of those listed only lead might be present, but in very small quantities, if any.	
	Acrylamide.....	
	Benzene.....	
	Chlorinated solvents.....	
	Formaldehyde.....	
	Organometallics.....	
	Phenol.....	
	Styrene.....	
	Tri-butyl phosphate.....	

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Other organophosphates.....
 Vinyl chloride.....
 Arsenic.....
 Barium.....
 Boron.....
 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
 EDTA.....
 DPTA.....
 NTA.....
 Polycarboxylic acids.....
 Other organic complexants.....
 Total complexing agents..... 0

LAW TREATMENT, PACKAGING AND DISPOSAL**Waste that is currently ILW:** The waste is expected to be LLW when retrieved.

Planned on-site / off-site treatments(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		100.0

Comment on planned treatments:

There may be an opportunity to segregate the waste for metal recycling and decontamination.

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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:

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	100.0	10	9

Other information: -

Waste Consigned to the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): -

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

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: -

WASTE STREAM**9F18****Miscellaneous Drummed Contaminated and Activated Items****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.

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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	3.57E-04	CC 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	3.00E-05	CC 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	8E-05	CC 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	1.87E-05	CC 2			Pb 210		8		
Co 60	4.13E-05	CC 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	8.27E-05	CC 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	3.00E-04	CC 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	CC 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	CC 2		
Ag 108m		8			U 235	4E-09	CC 2		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	2E-07	CC 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	5.46E-06	CC 2		
Sn 123		8			Pu 239	1E-05	CC 2		
Sn 126		8			Pu 240	1E-05	CC 2		
Sb 125	4.34E-09	CC 2			Pu 241	1.69E-04	CC 2		
Sb 126		8			Pu 242		8		
Te 125m	1.09E-09	CC 2			Am 241	3.38E-05	CC 2		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134	7.12E-08	CC 2			Cm 242		8		
Cs 135		8			Cm 243	1.51E-08	CC 2		
Cs 137	3.80E-04	CC 2			Cm 244	2.52E-07	CC 2		
Ba 133	3.18E-08	CC 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	8.42E-08	CC 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152	1.62E-07	CC 2			Other b/g				
Eu 154	2.28E-07	CC 2			Total a	5.99E-05	CC 2	0	
Eu 155	5.51E-08	CC 2			Total b/g	1.46E-03	CC 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