

WASTE STREAM	9C20	AETP Sludge
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SITE Dungeness A
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Magnox Limited
WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	~18.9 m ³
Total future arisings:		0 m ³
Total waste volume:		18.9 m ³

Comment on volumes: Heel of sludge from SST1 and SST2 (2m³), in addition to evap/ regen tank (0.6m³) and backwash tank 1&2 (3.07m³). Tank inspection carried out on the oil trap in early 2019 confirmed that additional 13.2m³ of sludge remains within the oil separator.

Uncertainty factors on volumes: Stock (upper): x 1.2 Arisings (upper) x
 Stock (lower): x 0.8 Arisings (lower) x

WASTE SOURCE The sludge originates from routine filtration of liquid effluents. Some of the sludge has also originated from filtration of cooling pond water. Pond sludge is now accumulated separately (see waste stream 9C16).

PHYSICAL CHARACTERISTICS

General description: The waste consists of debris washed from persons, floors and clothing, corrosion products such as magnesium hydroxide and carbonate detached from fuel elements, and extraneous materials such as flakes of paint. Also there is oil and some filter sand. Sludge particles may be up to millimetre size, and there will probably be 50-450 kg/m³ of dry material. Once fluidised the sludges should be readily transferred by pumping but reconcentration may be time consuming. There are no large items that may require special handling.

Physical components (%vol): Sludge (50%) and sand (50%). No other constituents anticipated.

Sealed sources: -

Bulk density (t/m³): 1.9

Comment on density: The bulk density of the sludge is expected to range from 1.05 to 1.15 t/m³ with an average of about 1.1 t/m³. Sand from sand filters (5.9 m³) will have a density of about 2.65 t/m³ so that the overall mean bulk density is about 1.9 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Magnesium hydroxide, magnesium carbonate, water, siliceous materials including sand, oil (~10% wt) and a range of other materials.

Chemical state: Alkali

Chemical form of radionuclides: H-3: H-3: Most tritium is expected to be present as water but some may be present in the form of other organic or inorganic compounds.
 C-14: C-14: Carbon 14 may be present as graphite.
 Se-79: Se-79: The chemical form of selenium has not been determined.
 Tc-99: Tc-99: The chemical form of technetium has not been determined.
 U: U: The chemical form of uranium isotopes has not been determined but may be uranium oxides.
 Np: Np: The chemical form of neptunium has not been determined.
 Pu: Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): The metal content has not been fully assessed, but some unreacted Magnox is expected. There are no bulk metal items present.

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Stainless steel.....
 Other ferrous metals.....
 Iron.....
 Aluminium.....
 Beryllium.....
 Cobalt.....
 Copper.....
 Lead.....
 Magnox/Magnesium.....
 Nickel.....
 Titanium.....
 Uranium.....
 Zinc.....
 Zircaloy/Zirconium.....
 Other metals.....

Organics (%wt):

The cellulosic material content of the waste has not been assessed. Approximately 10% wt of the waste is mineral oil with particulate matter and waters. Ion exchange resins would be expected in only trace quantities. Halogenated plastics and rubbers are not present.

Total cellulosics..... 0
 Paper, cotton.....
 Wood.....
 Halogenated plastics
 Total non-halogenated plastics..... 0
 Condensation polymers.....
 Others.....
 Organic ion exchange materials....
 Total rubber..... 0
 Halogenated rubber
 Non-halogenated rubber.....
 Hydrocarbons..... ~10.0
 Oil or grease ~10.0
 Fuel.....
 Asphalt/Tarmac (cont.coal tar)...
 Asphalt/Tarmac (no coal tar)....
 Bitumen.....
 Others.....
 Other organics.....

Other materials (%wt):

-
 Inorganic ion exchange materials.
 Inorganic sludges and flocs..... ~45.0
 Soil.....
 Brick/Stone/Rubble.....
 Cementitious material.....

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	Sand.....	~45.0
	Glass/Ceramics.....	
	Graphite.....	
	Desiccants/Catalysts.....	
	Asbestos.....	
	Non/low friable.....	
	Moderately friable.....	
	Highly friable.....	
	Free aqueous liquids.....	
	Free non-aqueous liquids.....	
	Powder/Ash.....	
Inorganic anions (%wt):	-	
	Fluoride.....	
	Chloride.....	
	Iodide.....	
	Cyanide.....	
	Carbonate.....	
	Nitrate.....	
	Nitrite.....	
	Phosphate.....	
	Sulphate.....	
	Sulphide.....	
Materials of interest for waste acceptance criteria:	Magnox, will ignite under appropriate conditions. There might be trace quantities of biological material.	
	Combustible metals.....	<1.0
	Low flash point liquids.....	
	Explosive materials.....	
	Phosphorus.....	
	Hydrides.....	
	Biological etc. materials.....	
	Biodegradable materials.....	
	Putrescible wastes.....	
	Non-putrescible wastes.....	
	Corrosive materials.....	
	Pyrophoric materials.....	
	Generating toxic gases.....	
	Reacting with water.....	<1.0
	Active particles.....	
	Soluble solids as bulk chemical compounds.....	

WASTE STREAM**9C20****AETP Sludge**Hazardous substances /
non hazardous pollutants:

-

Acrylamide.....

Benzene.....

Chlorinated solvents.....

Formaldehyde.....

Organometallics.....

Phenol.....

Styrene.....

Tri-butyl phosphate.....

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):

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants.....

Total complexing agents.....

TREATMENT, PACKAGING AND DISPOSAL

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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		100.0

Comment on planned treatments:

Waste will be encapsulated to meet LLWR WAC, likely to be in HHISO's. Waste may be co-disposed with LLW pond skips from SZA.

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:

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	6.3	3

Other information: -

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.

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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

Source: -

Uncertainty: Activity is derived from sample result ref's EX09246/06/10/25, EX09246/06/10/27, EX09246/06/10/23, DNA/WP/23605/RPT/6624.

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: Data taken from sample results in 2016 and decayed by three years for RWI 2019.

Other 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	2.97E-05	BB 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	1.51E-05	BB 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1.1E-06	BB 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	3.56E-05	BB 2			Pb 210		8		
Co 60	1.27E-05	BB 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	6.54E-05	BB 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	5.92E-04	BB 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	1.41E-07	BB 2			Th 234	3.32E-08	BB 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	4.32E-07	BB 2			U 232		8		
Ru 106	5.82E-07	BB 2			U 233		8		
Pd 107		8			U 234	3.16E-08	BB 2		
Ag 108m	7.49E-06	BB 2			U 235		8		
Ag 110m		8			U 236	2.98E-09	BB 2		
Cd 109		8			U 238	3.32E-08	BB 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	1.19E-04	BB 2		
Sn 123		8			Pu 239	2.05E-04	BB 2		
Sn 126		8			Pu 240	2.05E-04	BB 2		
Sb 125	6.73E-07	BB 2			Pu 241	3.81E-03	BB 2		
Sb 126		8			Pu 242		8		
Te 125m	1.69E-07	BB 2			Am 241	2.88E-04	BB 2		
Te 127m		8			Am 242m		8		
I 129	1.66E-09	BB 2			Am 243		8		
Cs 134	1.9E-06	BB 2			Cm 242	1.61E-07	BB 2		
Cs 135		8			Cm 243	1.58E-05	BB 2		
Cs 137	3.36E-03	BB 2			Cm 244	1.52E-05	BB 2		
Ba 133	5.49E-07	BB 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			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152	7.53E-07	BB 2			Other b/g				
Eu 154	4.16E-05	BB 2			Total a	8.48E-04	BB 2	0	
Eu 155	1.32E-05	BB 2			Total b/g	7.99E-03	BB 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