WASTE STREAM 9D24 Sludge

SITE	Hinkley Point A
SITE OWNER	Nuclear Decommissioning Authority
WASTE CUSTODIAN	Magnox Limited
WASTE TYPE	ILW
Is the waste subject to Scottish Policy:	No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	14.4 m³
Total future arisings:		0 m³
Total waste volume:		14.4 m³
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.1 Stock (lower): x 0.9	Arisings (upper) x Arisings (lower) x

WASTE SOURCE The sludge originates from routine filtration of cooling pond water and from special clean-up operations on cooling ponds.

PHYSICAL CHARACTERISTICS

General description:	Sludge removed from the pond sand pressure filters by backwashing and transfer to the sludge tank. The waste consists of debris/sludge filtered from pond water, effluents and clean-up operations. There will be some filter sand, small quantities of ion exchange material from Caesium Removal Units (CRU), paint flakes and waste hold up tank debris (rust and paint particulate). There are no large items that may require special handling.
Physical components (%wt):	Sand, sludge and other materials (~65%wt), water (~35%wt). The oil content was determined as ~<0.1%wt
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m³):	1.7
Comment on density:	The bulk density of the waste ranges from 1.5 to 1.9 t/m3.

CHEMICAL COMPOSITION

General description and components (%wt):	Water (~35% wt). Sand and sludge (~65% wt) which includes magnesium hydroxides and carbonates at ~>2%wt of the waste. The oil content was determined as ~<0.1%wt. Quantities of ion exchange material may also be present.
Chemical state:	Alkali
Chemical form of radionuclides:	H-3: Most tritium is expected to be present as water but some may be present in the form of other inorganic or organic compounds. C-14: Carbon 14 may be present as graphite. Cl-36: The chlorine 36 content is insignificant. U: The chemical form of uranium isotopes has not been determined but will probably be uranium oxides. Np: The chemical form of neptunium has not been determined. Pu: The chemical form of plutonium isotopes has not been determined but will probably be plutonium oxides.
Metals and alloys (%wt):	No sheet or bulk metal present.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	0		
Iron.....			
Aluminium.....	0		
Beryllium.....	0		
Cobalt.....			

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Copper	0	
Lead	0	
Magnox/Magnesium	TR	Some unreacted Magnox may be present.
Nickel		
Titanium		
Uranium		
Zinc	0	
Zircaloy/Zirconium	0	
Other metals	0	

Organics (%wt): There may be trace quantities of organic material present in the waste. There are no halogenated plastics or rubbers present.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	0		
Paper, cotton	0		
Wood	0		
Halogenated plastics	0		
Total non-halogenated plastics	0		
Condensation polymers	0		
Others	0		
Organic ion exchange materials	<1.0		
Total rubber	0		
Halogenated rubber	0		
Non-halogenated rubber	0		
Hydrocarbons			
Oil or grease	~0.10		
Fuel			
Asphalt/Tarmac (cont.coal tar)			
Asphalt/Tarmac (no coal tar)			
Bitumen			
Others			
Other organics	0		

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	TR		
Inorganic sludges and flocs	~65.0		
Soil	0		
Brick/Stone/Rubble	0		
Cementitious material	0		
Sand			
Glass/Ceramics	0		
Graphite	0		

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Desiccants/Catalysts.....	
Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	~35.0
Free non-aqueous liquids.....	0
Powder/Ash.....	0

Inorganic anions (%wt): Silicates and alumino-silicates may be present.

	(%wt)	Type(s) and comment
Fluoride.....	0	
Chloride.....	TR	
Iodide.....	0	
Cyanide.....	0	
Carbonate.....	~2.0	magnesium hydroxides and carbonates at ~>2%wt of the waste.
Nitrate.....	0	
Nitrite.....	0	
Phosphate.....	<0.10	
Sulphate.....	<<0.10	
Sulphide.....	0	

Materials of interest for waste acceptance criteria: The waste is unlikely to present a fire hazard but this requires confirmation since Magnox may be present and will ignite under appropriate conditions. There might be trace quantities of biological material.

	(%wt)	Type(s) and comment
Combustible metals.....	TR	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	TR	
Biodegradable materials.....	0	
Putrescible wastes.....	0	
Non-putrescible wastes.....		
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

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Hazardous substances / non hazardous pollutants: none expected

	(%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	

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Potential for the waste to contain discrete items:	No. In & of itself not a DI; assumed not likely to contain any "rogue" items that could be.

PACKAGING AND CONDITIONING

Conditioning method:	Encapsulation of mobile waste into 3m3 boxes
Plant Name:	-
Location:	Hinkley Point A Decommissioning Site
Plant startup date:	2023
Total capacity (m³/y incoming waste):	-
Target start date for packaging this stream:	2023
Throughput for this stream (m³/y incoming waste):	-
Other information:	-

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
3m³ box (round corners)	100.0	1.5	2.9	10

Likely container type comment:	-
Range in container waste volume:	-
Other information on containers:	-
Likely conditioning matrix:	
Other information:	-
Conditioned density (t/m³):	-
Conditioned density comment:	-
Other information on conditioning:	-
Opportunities for alternative disposal routing:	-

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

RADIOACTIVITY

Source:	Contaminated sludge. Contamination by fission products, actinides and activation products.
Uncertainty:	Specific activity is a function of Station operating history. The values quoted are indicative of the activities that might be 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:	The values quoted were derived by extrapolation from available measurements. The radiological data have been decay corrected from the analysis date provided in the characterisation report - PROG/HPA/WWF/0162. 30 Sept 2019 to 01 April 2022.

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Other information: -

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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	5.56E-03	C C 2		8	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	2.30E-03	C C 2		8	Ho 166m		8		8
Na 22		8			Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36	5.62E-07	C C 2		8	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54	<9.82E-09	C 3		8	Pb 205		8		8
Fe 55	2.11E-03	C C 2		8	Pb 210		8		8
Co 60	2.07E-03	C C 2		8	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	1.09E-02	C C 2		8	Po 210		8		8
Zn 65	<1.89E-09	C 3		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	1.42E-01	C C 2		8	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94		8		8	Th 234	1.16E-05	C C 2		8
Mo 93		8		8	Pa 231	1.95E-09	C C 2		8
Tc 97		8		8	Pa 233	2.86E-07	C C 2		8
Tc 99	9.56E-06	C C 2		8	U 232		8		8
Ru 106	<6.17E-06	C 3		8	U 233		8		8
Pd 107		8		8	U 234	1.03E-05	C C 2		8
Ag 108m		8		8	U 235	3.81E-07	C C 2		8
Ag 110m		8		8	U 236	1.53E-06	C C 2		8
Cd 109		8		8	U 238	1.16E-05	C C 2		8
Cd 113m		8		8	Np 237	2.87E-07	C C 2		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	5.94E-03	C C 2		8
Sn 123		8		8	Pu 239	8.70E-03	C C 2		8
Sn 126		8		8	Pu 240	8.7E-03	C C 2		8
Sb 125	<8.20E-05	C 3		8	Pu 241	1.44E-01	C C 2		8
Sb 126		8		8	Pu 242		8		8
Te 125m	<2.05E-05	C 3		8	Am 241	3.89E-02	C C 2		8
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	3.81E-06	C C 2		8	Cm 242	<1.03E-06	C 3		8
Cs 135		8		8	Cm 243	<5.18E-06	C 3		8
Cs 137	1.08E-01	C C 2		8	Cm 244	<9.49E-06	C 3		8
Ba 133		8		8	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144	<2.06E-07	C 3		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147	1.08E-04	C C 2		8	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151	2.30E-03	C C 2		8	Other a				
Eu 152		8		8	Other b/g				
Eu 154	8.83E-04	C C 2		8	**Total a**	**6.23E-02**	**C C 2**	**0**	
Eu 155	9.00E-05	C C 2		8	**Total b/g**	**4.21E-01**	**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