

WASTE STREAM	2C41	Fuel Skips in Pond
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SITE Chapelcross
SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE LLW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	43.5 m ³
Total future arisings:		0 m ³
Total waste volume:		43.5 m ³
Comment on volumes:	34 skips: volume calculated as 0.9906 x 1.1811 x 1.0922 x 34 = 43.45m ³	
Uncertainty factors on volumes:	Stock (upper):	x 1.2
	Stock (lower):	x 0.8
	Arisings (upper):	x
	Arisings (lower):	x

WASTE SOURCE Contamination from pond operations and plant operation.

PHYSICAL CHARACTERISTICS

General description: Skip dimensions are approximately 0.9906m x 1.1811m x 1.0922m
 Physical components (%vol): Pond skips are made of mild steel and are coated in UPC paint.
 Sealed sources: The waste does not contain sealed sources.
 Bulk density (t/m³): 0.35
 Comment on density: This has been calculated using a waste stream weight of 15.1 te and a volume of 43.45 m³

CHEMICAL COMPOSITION

General description and components (%wt): Steel and small amount of UPC paint. Fission products, actinides and other activation products will be present as contaminants.

Chemical state: Neutral

Chemical form of radionuclides: H-3: The tritium isotope content is insignificant.
 C-14: The carbon isotope content is insignificant.
 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 uranium isotope content is insignificant.
 Np: The neptunium content is insignificant.
 Pu: The chemical form of plutonium isotopes may be plutonium oxides.

Metals and alloys (%wt): Pond skips are constructed from 3.2 mm 10 gauge steel plate.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	96.8	Mild steel composition	
Iron.....			
Aluminium.....	0		
Beryllium.....			
Cobalt.....			
Copper.....	0		
Lead.....	0		
Magnox/Magnesium.....	0		
Nickel.....			

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Titanium.....
 Uranium.....
 Zinc..... 1.2 Zinc based primer
 Zircaloy/Zirconium..... 0
 Other metals..... 0

Organics (%wt): There may be organics in the UPC paint.

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

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.....	0		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	0		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			

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Free aqueous liquids.....	0
Free non-aqueous liquids.....	0
Powder/Ash.....	0

Inorganic anions (%wt): -

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

Materials of interest for waste acceptance criteria: No materials likely to pose a fire or other non-radiological hazard have been identified.

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

Hazardous substances / non hazardous pollutants: -

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		

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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):

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

Potential for the waste to contain discrete items: Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs; Stainless items assumed DIs

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	On-site	100.0

Comment on planned treatments:

Skips will be cut to fit into containers. It is estimated that 24 skips can be packaged inside a HHISO container; 16 cut skips inside 8 whole skips.

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
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	0.35

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
-	-	-	-	-	-

Waste Packaging for Disposal:

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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	30.67	2

Other information: WCH LLWT-01-18-2019-02-01 validity has lapsed. A new WCH would need to be agreed prior to disposal. Skip characterisation is under review.

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.

Waste consigned for disposal to LLWR in year of generation: -

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: Contamination from pond operations and plant operation.

Uncertainty: -

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: Skip activities are taken from waste stream fingerprint in WCH LLWT-01-18-2019-02-01 and then decayed by five years to 01/04/2022

Other information: -

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	7.51E-06	CC 1			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	4.06E-06	CC 1			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1.43E-08	CC 1			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	1.60E-07	CC 1			Pb 210		8		
Co 60	7.28E-07	CC 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	7.55E-07	CC 1			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	1.53E-03	CC 1			Th 227		8		
Zr 93		8			Th 228	8.03E-09	CC 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m		8			Th 232		8		
Nb 94		8			Th 234	2.09E-08	CC 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	4.29E-07	CC 1			U 232	9.43E-09	CC 1		
Ru 106	1.55E-09	CC 2			U 233		8		
Pd 107		8			U 234	2.14E-08	CC 1		
Ag 108m		8			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	2.09E-08	CC 1		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	1.09E-05	CC 1		
Sn 123		8			Pu 239	7.10E-06	CC 1		
Sn 126		8			Pu 240	8.73E-06	CC 1		
Sb 125	8.00E-08	CC 2			Pu 241	3.36E-04	CC 1		
Sb 126		8			Pu 242	6.9E-09	CC 2		
Te 125m	2.00E-08	CC 2			Am 241	6.80E-05	CC 1		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134	1.20E-07	CC 2			Cm 242		8		
Cs 135		8			Cm 243	1.09E-08	CC 1		
Cs 137	6.45E-04	CC 2			Cm 244	2.37E-07	CC 1		
Ba 133		8			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-07	CC 1			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	7.97E-06	CC 1			Other a				
Eu 152	7.55E-08	CC 2			Other b/g				
Eu 154	2.07E-06	CC 2			Total a	9.51E-05	CC 2	0	
Eu 155	4.37E-07	CC 2			Total b/g	2.54E-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