WASTE STREAM 5C46 Uranic Residues

SITE Harwell

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.....	8.1 m³
Total future arisings:		0 m³
Total waste volume:		8.1 m³

Comment on volumes: The strategy is to transfer uranic residues to Springfields for re-use. Following the transfer of 5.1m3 of this waste stream to Springfields during 2015 the volume left in stock has been reviewed and updated accordingly for the 2022 RWI

Uncertainty factors on volumes:

Stock (upper):	x 1.1	Arisings (upper)	x
Stock (lower):	x 0.9	Arisings (lower)	x

WASTE SOURCE Waste consists of bulk items of natural and depleted uranium from various building at Harwell and through the National Disposal Service (NDS).

PHYSICAL CHARACTERISTICS

General description: The stream consists of Natural and Depleted Uranium bulk items, e.g. shielding, counter balance weight, empty source containers.

Physical components (%vol): Solid U/ DU/ Unat metal.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~6.14

Comment on density: Total recorded mass divided by total recorded volume.

CHEMICAL COMPOSITION

General description and components (%wt): Uranium 98.5% (Depleted Uranium 93.43%, Natural Uranium 6.57%), Steel 1.5%

Chemical state: Neutral

Chemical form of radionuclides: Ra: Decay product.
Th: Decay product.
U: Predominantly metal. Dioxide in fuel compacts.

Metals and alloys (%wt): No metal sheet present.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~1.5		
Other ferrous metals.....	0		
Iron.....			
Aluminium.....	TR		
Beryllium.....	0		
Cobalt.....			
Copper.....	0		
Lead.....	0		
Magnox/Magnesium.....	0		
Nickel.....			
Titanium.....			

WASTE STREAM 5C46 Uranic Residues

Uranium	98.5	Depleted Uranium 93.43%, Natural Uranium 6.57%
Zinc	0	
Zircaloy/Zirconium	0	
Other metals	0	

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	0		
Paper, cotton	0		
Wood	0		
Halogenated plastics	TR	Possible PVC wrapping.	
Total non-halogenated plastics	0		
Condensation polymers	0		
Others	0		
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	0		

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	TR		
Desiccants/Catalysts			
Asbestos	0		
Non/low friable			
Moderately friable			
Highly friable			
Free aqueous liquids	0		

WASTE STREAM 5C46 Uranic Residues

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

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: Principally bulk metal items. Combustible metal is U

	(%wt)	Type(s) and comment
Combustible metals.....	~99.0	
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: None expected

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

WASTE STREAM 5C46 Uranic Residues

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.....		

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

PACKAGING AND CONDITIONING

Conditioning method: The majority of this stream will be transferred to Springfields in order to be recycled. Any waste that can not be transferred for reuse will be processed via the Harwell cells and reallocated to the appropriate stream as necessary.

Plant Name: -

Location: -

Plant startup date: -

Total capacity (m^3/y incoming waste): -

WASTE STREAM 5C46 Uranic Residues

Target start date for packaging this stream: -

Throughput for this stream (m^3/y incoming waste): -

Other information: -

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix:

Other information: -

Conditioned density (t/m^3): -

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: Uranium materials. Other isotopes by irradiation in zero-energy reactors.

Uncertainty: Main uncertainty is in relative volumes of components comprising the stream

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: Recorded masses of U, DU.

Other information: -

WASTE STREAM 5C46 Uranic Residues

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		8			Gd 153		8		
Be 10		8			Ho 163		8		
C 14		8			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36		8			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			Pb 210		8		
Co 60	4.19E-09	B B 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63		8			Po 210		8		
Zn 65		8			Ra 223	5.02E-08	B B 2		
Se 79		8			Ra 225		8		
Kr 81		8			Ra 226	7.17E-09	B B 2		
Kr 85		8			Ra 228	9.63E-09	B B 2		
Rb 87		8			Ac 227	5.11E-08	B B 2		
Sr 90	5.51E-07	B B 2			Th 227	4.98E-08	B B 2		
Zr 93		8			Th 228	8.99E-09	B B 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230	2.76E-06	B B 2		
Nb 93m		8			Th 232	1.09E-08	B B 2		
Nb 94		8			Th 234	4.08E-02	B B 2		
Mo 93		8			Pa 231	3.03E-07	B B 2		
Tc 97		8			Pa 233		8		
Tc 99		8			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	2.51E-02	B B 2		
Ag 108m		8			U 235	1.19E-03	B B 2		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	4.08E-02	B B 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	2.19E-08	B B 2		
Sn 123		8			Pu 239	6.19E-09	B B 2		
Sn 126		8			Pu 240	1.6E-08	B B 2		
Sb 125		8			Pu 241	2.71E-07	B B 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	2.27E-07	B B 2		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134		8			Cm 242		8		
Cs 135		8			Cm 243		8		
Cs 137	7.04E-07	B B 2			Cm 244	3.39E-09	B B 2		
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			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152		8			Other b/g				
Eu 154	3.64E-09	B B 2			**Total a**	**6.71E-02**	**B B 2**	**0**	
Eu 155	1.51E-09	B B 2			**Total b/g**	**4.08E-02**	**B B 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