WASTE STREAM 2E191 Decommissioning Wastes for Clifton Marsh Disposal

SITE Springfields

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Springfields Fuels Limited

WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m³
Future arisings -	1.4.2019 - 31.3.2021.....	~6666.0 m³
	1.4.2021 - 31.3.2030.....	~2777.0 m³
	1.4.2030 - 31.3.2040.....	~0 m³
	1.4.2040 - 31.3.2050.....	~111198.0 m³
	1.4.2100 - 31.3.2110.....	~76507.0 m³
Total future arisings:		197148.0 m³
Total waste volume:		197148.0 m³

Comment on volumes: This waste is generated as a direct result of decommissioning activities on the Springfields Site. Decommissioning takes place when plants cease operation, in line with the current Business Plan. Consequently, there will be significant fluctuations in the amount of waste generated during a given period. The waste volumes are generated by the Springfields Decommissioning Model, which assesses each building on the seen volume and the predicted level of contamination inside the building. The decommissioning model data is periodically reviewed and has proved prudent over the 13 years of the Springfields Decommissioning Programme. The radwaste disposals that Springfields make to the Clifton Marsh Landfill Site have changed with the issue to SITA (UK) Ltd (the site operator) of a new disposal authorisation to support the UK radwaste strategy. The activity concentrations limits within the new authorisation are higher within the scope of LLW than in previous authorisations. Uranium is the predominant disposal radionuclide in Springfields disposals to CMLFS, the site is authorised to accept material for disposal up to concentrations around the 200Bq/g level (0.2GBq/tonne). This clearly straddles the formally accepted definitions of VLLW and into the lower reaches of LLW.

Uncertainty factors on volumes:

Stock (upper):	x	Arisings (upper)	x 1.2
Stock (lower):	x	Arisings (lower)	x 0.8

WASTE SOURCE The waste arises from decommissioning of uranium processing and fabrication facilities.

PHYSICAL CHARACTERISTICS

General description: Waste comprises plant equipment, structural and building materials and soil. The waste includes compactable and non compactable waste. A proportion of the waste will have been decontaminated prior to identification.

Physical components (%wt): Metal (40%), rubble / concrete (40%), plastics / rubber (5%), asbestos (5%), wood (<0.5%), soft organics (5%) and others (4.5%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1.8

Comment on density: Estimated average density of raw decommissioning waste.

CHEMICAL COMPOSITION

General description and components (%wt): Metal (40%), rubble / concrete (40%), plastics / rubber (5%), asbestos (5%), wood (<0.5%), soft organics (5%) and others (4.5%).

Chemical state: Neutral

Chemical form of radionuclides:
H-3: Not expected to be present
C-14: Not expected to be present
Cl-36: Not expected to be present
Se-79: Not expected to be present
Tc-99: Older facilities that had this Nuclide present have been Decommissioned but each project has a new fingerprint validated to ensure it is not present
I-129: Not expected to be present
Ra: Not expected to be present
Th: Not expected to be present
U: Oxides, fluorides and nitrates of uranium.

Np: Older facilities that had this Nuclide present have been Decommissioned but each project has a new fingerprint validated to ensure it is not present
Pu: Not expected to be present

Metals and alloys (%wt): Both bulk and sheet metal may be present, proportions and sizes cannot be determined until waste is generated.

Stainless steel	~10.0
Other ferrous metals	~10.3
Iron	~9.0
Aluminium	~4.0
Beryllium	0
Cobalt	0
Copper	<1.5
Lead	~1.0
Magnox/Magnesium	0
Nickel	0
Titanium	0
Uranium	<0.20
Zinc	~4.0
Zircaloy/Zirconium	0
Other metals	0

Organics (%wt): -

Total cellulosics	4.0
Paper, cotton	~3.5
Wood	<0.50
Halogenated plastics	3.0
Total non-halogenated plastics	1.0
Condensation polymers	0
Others	0
Organic ion exchange materials	0
Total rubber	1.0
Halogenated rubber	0
Non-halogenated rubber	1.0
Hydrocarbons	0
Oil or grease	0
Fuel	0
Asphalt/Tarmac (cont.coal tar)	0
Asphalt/Tarmac (no coal tar)	0
Bitumen	0
Others	0
Other organics	2.0

Other materials (%wt): -

	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs.....	2.0	
	Soil.....	2.0	
	Brick/Stone/Rubble.....	2.0	
	Cementitious material.....	36.0	
	Sand.....	0	
	Glass/Ceramics.....	1.5	
	Graphite.....	0.50	
	Desiccants/Catalysts.....	0	
	Asbestos.....	~5.0	Mostly building fabric in sheet form some old lagging from process vassals and may be either Amosite, Chrysotile or Crocidolite
	Non/low friable.....	~5.0	
	Moderately friable.....	0	
	Highly friable.....	0	
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....	0	
Inorganic anions (%wt):	Trace amounts only maybe present depending on origin of waste.		
	Fluoride.....	~1.0	
	Chloride.....	0	
	Iodide.....	0	
	Cyanide.....	0	
	Carbonate.....	0	
	Nitrate.....	0	
	Nitrite.....	~1.0	
	Phosphate.....	0	
	Sulphate.....	0	
	Sulphide.....	0	
Materials of interest for waste acceptance criteria:	Asbestos will be present and potential for certain materials to be contaminated with beryllium in very small quantities.		
	Combustible metals.....	NE	
	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.....	0	
	Corrosive materials.....	NE	
	Pyrophoric materials.....	0	

WASTE STREAM	2E191	Decommissioning Wastes for Clifton Marsh Disposal

Generating toxic gases..... 0

Reacting with water..... 0

Active particles..... 0

Soluble solids as bulk chemical compounds..... 0

Hazardous substances / non hazardous pollutants: Asbestos (~5%) and beryllium contaminated materials (<0.1%).

Acrylamide..... 0

Benzene..... 0

Chlorinated solvents..... 0

Formaldehyde..... 0

Organometallics..... 0

Phenol..... 0

Styrene..... 0

Tri-butyl phosphate..... 0

Other organophosphates..... 0

Vinyl chloride..... NE

Arsenic..... 0

Barium..... 0

Boron..... 0

Cadmium..... 0

Caesium..... 0

Selenium..... 0

Chromium..... 0

Molybdenum..... 0

Thallium..... 0

Tin..... 0

Vanadium..... 0

Mercury compounds..... 0

Others..... 0

Electronic Electrical Equipment (EEE)

EEE Type 1..... 0

EEE Type 2..... 0

EEE Type 3..... 0

EEE Type 4..... 0

EEE Type 5..... 0

Complexing agents (%wt): Not yet determined

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids……

Other organic complexants.....

Total complexing agents.....

WASTE STREAM 2E191 Decommissioning Wastes for Clifton Marsh Disposal

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)		
Incineration		
Solidification		
Decontamination	On-site	~80.0
Metal treatment		
Size reduction		
Decay storage		
Recyling / reuse	On-site	~5.0
Other / various		
None	On-site	~15.0

Comment on planned treatments: On-site wet decontamination process.

Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	
Expected to be consigned to a Landfill Facility	95.0
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	5.0
Disposal route not known	

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: (Not applicable to this waste stream)

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			

Other information: Routinely consigned to landfill sites or municipal waste incinerators in 210 l drums or loose tipped.

Waste Planned for Disposal at the LLW Repository: (Not applicable to this waste stream)

Container voidage: -

WASTE STREAM 2E191 Decommissioning Wastes for Clifton Marsh Disposal

Waste Characterisation Form (WCH):	-
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:	The main source of activity is contamination by uranium and its daughters. The waste becomes contaminated from contact with intermediate uranium compounds during the fuel manufacturing process.
Uncertainty:	Activities are estimated on the basis that site processes a mixture of natural and enriched material.
Definition of total alpha and total beta/gamma:	The waste stream is contaminated by coming in contact with Uranium and its intermediate products (oxides). The uranium is from a series of enrichments with a Site mean of 3.2%U235, it is assumed that the uranium is not irradiated therefore contains no reactor products and is aged to a point of equilibrium. This waste stream typically has an activity concentration of 50Bq/g therefore this is split equally between alpha and beta/ gamma activity.
Measurement of radioactivities:	by chemical analysis
Other information:	Initially, a wide range of activities will be associated with decommissioning wastes from trace active materials upwards. Much of this waste will be decontaminable. A total activity is assumed in the Radionuclide tab based on the site generic fingerprint and has been assumed a 50:50 split between alpha and b/g.

WASTE STREAM 2E191 Decommissioning Wastes for Clifton Marsh Disposal

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137					Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152					Other b/g				
Eu 154					**Total a**	**0**		**2.5E-05**	**B B 2**
Eu 155					**Total b/g**	**0**		**2.5E-05**	**B B 2**

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