

**WASTE STREAM****9E960****Active Waste Store, Active Laundry LLW**

**SITE** Oldbury  
**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.....	9.0 m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2023.....	19.0 m <sup>3</sup>
	1.4.2023 - 31.3.2024.....	15.0 m <sup>3</sup>
	1.4.2024 - 31.3.2026.....	20.0 m <sup>3</sup>
	1.4.2026 - 31.3.2031.....	16.8 m <sup>3</sup>
Total future arisings:		70.8 m <sup>3</sup>
Total waste volume:		79.8 m <sup>3</sup>

Comment on volumes: -

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

**WASTE SOURCE** The 9E960 waste stream will be used to capture waste mainly from the Vacuum Cleaners (VC) and Active Waste Store (AWS) areas with smaller quantities generated from site labs, Unitech returns and Miscellaneous Contaminated Items (MCI) soft waste.

**PHYSICAL CHARACTERISTICS**

**General description:** The waste consigned under waste stream 9E960 mainly comprises metal, concrete and rubble, soil, biodegradable materials, plasterboard, plastics, rubber, wood and other materials. Metals are likely to include steel (stainless and mild), lead, iron, copper, zinc, magnesium and aluminium. Other materials, include asbestos, vacuum debris, oil and glass. The waste is expected to be in the form of mixed trash with occasional large items such as pipework, motors, pumps, lifting equipment and frames. Vacuum debris includes building dust and organic matter.

**Physical components (%wt):** Metal (~30% wt), concrete/rubble (3%), soil (2%), biodegradables (35%), plasterboard (1%), plastics (10%), rubber (9%), wood (~4%), other organic (1%), and others including vacuum debris from redundant incinerator (~5%).

**Sealed sources:** The waste does not contain sealed sources.

**Bulk density (t/m<sup>3</sup>):** ~0.52

**Comment on density:** Data taken from WCH mass divided by volume.

**CHEMICAL COMPOSITION**

**General description and components (%wt):** Metal (~30% wt), concrete/rubble (3%), soil (2%), biodegradables (35%), plasterboard (1%), plastics (10%), rubber (9%), wood (~4%), other organic (1%), and others including vacuum debris from redundant incinerator (~5%).

**Chemical state:** Neutral

**Chemical form of radionuclides:**  
 H-3: Chemical form of tritium has not been determined.  
 C-14: Chemical form of carbon 14 has not been determined.  
 Cl-36: Chemical form of chlorine 36 has not been determined.  
 Se-79: The selenium-79 content is insignificant.  
 Tc-99: The technetium-99 content is insignificant.  
 I-129: The iodine-129 content is insignificant.  
 Ra: The radium isotope content is insignificant.  
 Th: The thorium content is insignificant.  
 U: The uranium isotope content is insignificant.  
 Np: The neptunium isotope content is insignificant.  
 Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

**Metals and alloys (%wt):** -

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	5.1	Items such as pipework, flooring plates, brackets, frames.	
Other ferrous metals.....	20.3	Mild steel - Items such as pipework, flooring plates, brackets, frames.	
Iron.....	0.64	Trace in waste items such as power hand tools.	
Aluminium.....	0.71	Aluminium in waste items such as ladders and ducting.	
Beryllium.....	NE		
Cobalt.....			
Copper.....	0.14	Trace in waste items such as pipework.	
Lead.....	2.9	Sheet,pipe,block and shot.	
Magnox/Magnesium.....	TR	Trace in waste items such as power hand tools.	
Nickel.....			
Titanium.....			
Uranium.....	NE		
Zinc.....	0.29	Galvanised steel in items such as gratings or buckets.	
Zircaloy/Zirconium.....	0		
Other metals.....	0	Mass estimates in the table above for mild steel and stainless steel include the constituent alloying elements such as Cr, Fe, Ni and Co. Therefore, these constituent alloying elements are not recorded separately to avoid double accounting.	

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~4.0		
Paper, cotton.....	0		
Wood.....	~4.0		
Halogenated plastics .....	~4.0	PVC, PPE.	
Total non-halogenated plastics.....	~6.0		
Condensation polymers.....	~3.0	Pipes, poly, PPE, perspex, containers, sheet and hoses.	
Others.....	~3.0	Pipes, poly, PPE, perspex, containers, sheet and hoses.	
Organic ion exchange materials....	0		
Total rubber.....	~9.0		
Halogenated rubber .....	~9.0	Neoprene.	
Non-halogenated rubber.....			
Hydrocarbons.....			
Oil or grease .....			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			

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Asphalt/Tarmac (no coal tar).....			
Bitumen.....			
Others.....			
Other organics.....	~1.0		
Other materials (%wt):	-		
	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	2.0		
Brick/Stone/Rubble.....	3.0		
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	0.06	0.03% MMMF lagging (associated with general plant items), 0.03% glass.	
Graphite.....	TR		
Desiccants/Catalysts.....			
Asbestos.....	~0.06		
Non/low friable.....	0.03	Gaskets/joints - chrysotile (white).	
Moderately friable.....	0		
Highly friable.....	~0.03	Lagging / gaskets - chrysotile (white).	
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	2.9	Vacuum debris produced from redundant incinerator (weight = 1000kg).	
Inorganic anions (%wt):	-		
	(%wt)	Type(s) and comment	
Fluoride.....	1.0	Inorganic anions.	
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:	-		

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	(%wt)	Type(s) and comment
Combustible metals.....	0	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	TR	
Biodegradable materials.....	35.0	
Putrescible wastes.....	1.0	
Non-putrescible wastes.....	34.0	
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	TR	
Reacting with water.....	P	33.85m2
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

Hazardous substances / Toxic metals are not expected to be present.  
non hazardous pollutants:

	(%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.....		

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Mercury compounds.....  
 Others..... 2.0      Others include EEE materials. Weight of EEE materials is approx. 700kg.

Electronic Electrical Equipment (EEE)  
 EEE Type 1..... P      25 off Items with circuit boards.  
 EEE Type 2..... P      50 off Plant items containing electrical components e.g. pumps and motors, transformers and capacitors.  
 EEE Type 3..... P      100 off Electrical tools e.g. saws and drills.  
 EEE Type 4..... P      25 off Fluorescent tubes / lamps.  
 EEE Type 5..... P      10 off Rechargeable batteries, Nickel-Cadmium/Lithium-Ion.

Complexing agents (%wt):      No

(%wt)      Type(s) and comment

EDTA.....  
 DPTA.....  
 NTA.....  
 Polycarboxylic acids.....  
 Other organic complexants.....  
 Total complexing agents..... 0

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**

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

Treatment	On-site / Off site	Stream volume %
Low force compaction	On-site	11.9
Supercompaction (HFC)	Off-site	11.9
Incineration	Off-site	59.3
Solidification		
Decontamination		
Metal treatment	Off-site	5.9
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		23.0

Comment on planned treatments:      11.11% of this waste stream is expected to be sent for VLLW disposal to landfill.

**Disposal Routes:**

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	23.7	0.52
Expected to be consigned to a Landfill Facility	11.1	0.52
Expected to be consigned to an On-Site Disposal Facility		
Expected to be consigned to an Incineration Facility	59.3	0.40
Expected to be consigned to a Metal Treatment Facility	5.9	1.4
Expected to be consigned as Out of Scope		
Expected to be recycled / reused		
Disposal route not known		

Classification codes for waste expected to be consigned to a landfill facility:      17 04 05, 17 01 07, 17 02 01, 17 02 02, 17 02 03, 17 05 04, 17 06 04, 17 06 01\*

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**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:**

Container	Stream volume %	Waste loading m <sup>3</sup>	Number of packages
1/3 Height IP-1 ISO			
2/3 Height IP-2 ISO			
1/2 Height WAMAC IP-2 ISO	11.9	~43.2	< 1
1/2 Height IP-2 Disposal/Re-usable ISO	11.9	~10	< 1
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: 43.2m3 loading volume is calculated based on the fact that you can low force compact two times the normal volume of waste into a 200 litre/0.2m3 drum (400 litres/0.4m3), you can then fit 36 drums (14.4m3) into a 1/2 height ISO, each drum can be super-compacted to a 1/3 of its original volume so therefore we can get 3 x the amount of un-compacted drums into the final disposal container (43.2m3).

**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 has a current WCH. Inventory information is consistent with the current WCH.

Waste consigned for disposal to LLWR in year of generation: Yes.

**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**

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Source:	Fission products, actinides and activation products.
Uncertainty:	Activity values are current best estimates. Specific activity is a function of Station operating history. The values quoted are indicative of the activities that would be expected, although demolition wastes are predicted to be lower in activity than the routine operational wastes and so the values quoted for this stream are expected to be an over estimate.
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 WCH - 1MXN-3OLD-0-WCH-0-4748 V4 decayed for 1 year for RWI 2022
Other information:	-

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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	4.5E-06	CC 1	4.5E-06	CC 1	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	5.18E-07	CC 1	5.18E-07	CC 1	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36	5.7E-08	CC 1	5.7E-08	CC 1	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		8		8	Pb 205		8		8
Fe 55	1.47E-07	CC 1	1.47E-07	CC 1	Pb 210		8		8
Co 60	6.39E-08	CC 2	6.39E-08	CC 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	1.33E-07	CC 1	1.33E-07	CC 1	Po 210		8		8
Zn 65		8		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	6.75E-05	CC 1	6.75E-05	CC 1	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	1.03E-08	CC 2	1.03E-08	CC 2	Th 234	2.01E-08	CC 2	2.01E-08	CC 2
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106	2.01E-08	CC 2	2.01E-08	CC 2	U 233		8		8
Pd 107		8		8	U 234	1.74E-08	CC 2	1.74E-08	CC 2
Ag 108m	2.1E-08	CC 2	2.1E-08	CC 2	U 235		8		8
Ag 110m		8		8	U 236	2.62E-09	CC 2	2.62E-09	CC 2
Cd 109		8		8	U 238	2.01E-08	CC 2	2.01E-08	CC 2
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	3.72E-07	CC 1	3.72E-07	CC 1
Sn 123		8		8	Pu 239	4.26E-07	CC 1	4.26E-07	CC 1
Sn 126		8		8	Pu 240	5.51E-07	CC 1	5.51E-07	CC 1
Sb 125	8.14E-09	CC 2	8.14E-09	CC 2	Pu 241	1.65E-05	CC 1	1.65E-05	CC 1
Sb 126		8		8	Pu 242		8		8
Te 125m	2E-09	CC 2	2E-09	CC 2	Am 241	3.5E-06	CC 1	3.5E-06	CC 1
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	1.43E-07	CC 2	1.43E-07	CC 2	Cm 242		8		8
Cs 135		8		8	Cm 243	5.66E-08	CC 1	5.66E-08	CC 1
Cs 137	5.91E-05	CC 2	5.91E-05	CC 2	Cm 244	9.09E-07	CC 1	9.09E-07	CC 1
Ba 133	1.66E-08	CC 2	1.66E-08	CC 2	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144	1.12E-09	CC 2	1.12E-09	CC 2	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147	8.56E-07	CC 1	8.56E-07	CC 1	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152	5.39E-08	CC 2	5.39E-08	CC 2	Other b/g				
Eu 154	1.96E-08	CC 2	1.96E-08	CC 2	<b>Total a</b>	<b>5.85E-06</b>	<b>CC 2</b>	<b>5.85E-06</b>	<b>CC 2</b>
Eu 155	9.89E-09	CC 2	9.89E-09	CC 2	<b>Total b/g</b>	<b>1.50E-04</b>	<b>CC 2</b>	<b>1.50E-04</b>	<b>CC 2</b>

**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