WASTE STREAM 9E49 Contaminated Gravel

SITE Oldbury

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	4.0 m³
Total future arisings:		0 m³
Total waste volume:		4.0 m³

Comment on volumes: Gravel will be removed from the vaults when the wastes accumulated in the vault are retrieved, probably in 2023.

Uncertainty factors on volumes:

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

WASTE SOURCE Contaminated gravel (stone chippings) on the floor of a vault. The gravel was applied before any waste was discharged to the facility.

PHYSICAL CHARACTERISTICS

General description: Contaminated gravel. There are no large items.

Physical components (%vol): 100% contaminated gravel. Likely to be either limestone or silica based.

Sealed sources: -

Bulk density (t/m³): ~1.5

Comment on density: The gravel is assumed to be either limestone or silica based. The density range has not been estimated.

CHEMICAL COMPOSITION

General description and components (%wt): The chemical composition of the chippings is not known. It is likely that either silica or limestone based material has been used. Fission products, actinides and other activation products will be present as contaminants.

Chemical state: Neutral

Chemical form of radionuclides:
H-3: Tritium will be present in the form of tritiated water.
C-14: Carbon 14 will be present in the form of graphite dust contamination.
Cl-36: Chlorine 36 will be present in graphite dust contamination.
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: Uranium may be present as natural uranium metal contamination.
Np: The neptunium content is insignificant.
Pu: Plutonium may be present as metal or oxide.

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

Stainless steel.....	0	
Other ferrous metals.....	0	
Iron.....		
Aluminium.....	0	
Beryllium.....	NE	
Cobalt.....		
Copper.....	0	
Lead.....	0	
Magnox/Magnesium.....	NE	Only trace metallic content would be expected to be associated with the original gravel, but there may be contamination from the

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			wastes resting on the gravel.
	Nickel		
	Titanium		
	Uranium		
	Zinc	0	
	Zircaloy/Zirconium	NE	
	Other metals	0	No "other" metals are expected.
Organics (%wt):	Organics may be present in trace quantities. Halogenated plastics and rubbers will not be present.		
	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	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	TR	
Other materials (%wt):	Some graphite contamination.		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs	0	
	Soil	0	
	Brick/Stone/Rubble	100.0	
	Cementitious material	0	
	Sand		
	Glass/Ceramics	0	
	Graphite	TR	
	Desiccants/Catalysts		
	Asbestos	0	
	Non/low friable		
	Moderately friable		
	Highly friable		
	Free aqueous liquids	TR	

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Free non-aqueous liquids	0
Powder/Ash	TR

Inorganic anions (%wt): The inorganic anion content of the gravel has not been fully assessed. Carbonates and silicates may be present.

Fluoride	NE
Chloride	NE
Iodide	NE
Cyanide	0
Carbonate	NE
Nitrate	NE
Nitrite	NE
Phosphate	NE
Sulphate	NE
Sulphide	NE

Materials of interest for waste acceptance criteria: There may be some Magnox mixed with the gravel. This could ignite under appropriate conditions.

Combustible metals	NE
Low flash point liquids	0
Explosive materials	0
Phosphorus	0
Hydrides	0
Biological etc. materials	0
Biodegradable materials	
Putrescible wastes	0
Non-putrescible wastes	
Corrosive materials	0
Pyrophoric materials	0
Generating toxic gases	0
Reacting with water	NE
Active particles	
Soluble solids as bulk chemical compounds	

Hazardous substances / non hazardous pollutants: None expected.

Acrylamide	
Benzene	
Chlorinated solvents	
Formaldehyde	
Organometallics	
Phenol	
Styrene	
Tri-butyl phosphate	
Other organophosphates	
Vinyl chloride	

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	Arsenic.....
	Barium.....
	Boron.....
	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):	Yes
	EDTA.....
	DPTA.....
	NTA.....
	Polycarboxylic acids……
	Other organic complexants.....
	Total complexing agents..... TR

PACKAGING AND CONDITIONING

Conditioning method:	The gravel will be retrieved when the rest of the vault contents are retrieved. It might be washed and any LLW material subsequently separated from ILW but in view of the small volume of this stream all of the waste is expected to be managed as ILW.
Plant Name:	-
Location:	Oldbury Power Station
Plant startup date:	2023
Total capacity (m^3/y incoming waste):	~500.0
Target start date for packaging this stream:	2023
Throughput for this stream (m^3/y incoming waste):	4.0
Other information:	-

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Likely container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages
3m^3 RS box	100.0	2	2.5	2

Likely container type comment:	No volume reduction or increase is anticipated.
Range in container waste volume:	No significant variability is expected.
Other information on containers:	The package material is expected to be stainless steel or mild steel if applicable.
Likely conditioning matrix:	None
Other information:	If the waste is ILW it will be conditioned in Type VI DCIC.
Conditioned density (t/m^3):	~1.5
Conditioned density comment:	This density is expected to vary by not more than 10% from the average.
Other information on conditioning:	-
Opportunities for alternative disposal routing:	

Treatment	Stream volume (%)	Comment
-	-	-

RADIOACTIVITY

Source:	Contamination may have been transferred to the chippings via direct contact with waste materials and this may have been enhanced by moisture from the waste. The ability of the chippings to absorb soluble active materials depends on the chemical composition of the chippings themselves.
Uncertainty:	The waste is assumed to be ILW. This can be confirmed only when the waste is retrieved. The waste may be rendered LLW by washing.
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:	Levels of contamination have been estimated from the activity of the Magnox debris in the vault.
Other information:	-

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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	1.21E-04	C C 2			Gd 153		8		
Be 10	2E-08	C C 2			Ho 163		8		
C 14	1.00E-05	C C 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26	1E-07	C C 2			Tm 171		8		
Cl 36	2E-05	C C 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41	<2E-06	C 3			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	4.04E-07	C C 2			Pb 210		8		
Co 60	<6.13E-03	C 3			Bi 208		8		
Ni 59	3E-03	C C 2			Bi 210m		8		
Ni 63	3.76E-01	C C 2			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	2.42E-06	C C 2			Th 227		8		
Zr 93	1E-06	C C 2			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	5.87E-07	C C 2			Th 232		8		
Nb 94		8			Th 234	3E-09	C C 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99		8			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	3.06E-09	C C 2		
Ag 108m	3.94E-07	C C 2			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	3E-09	C C 2		
Cd 113m	<3.82E-06	C 3			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m	<1.78E-05	C 3			Pu 238	1.86E-06	C C 2		
Sn 123		8			Pu 239	1.00E-06	C C 2		
Sn 126		8			Pu 240	2.00E-06	C C 2		
Sb 125	4.14E-09	C C 2			Pu 241	1.95E-05	C C 2		
Sb 126		8			Pu 242		8		
Te 125m	1.04E-09	C C 2			Am 241	5.28E-06	C C 2		
Te 127m		8			Am 242m	8.61E-09	C C 2		
I 129		8			Am 243	3.00E-09	C C 2		
Cs 134		8			Cm 242	7.11E-09	C C 2		
Cs 135		8			Cm 243	1.62E-09	C C 2		
Cs 137	4.07E-06	C C 2			Cm 244	2.12E-08	C C 2		
Ba 133	<2.21E-06	C 3			Cm 245		8		
La 137	<5E-07	C 3			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	<3.71E-07	C 3			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	7.46E-09	C C 2			Other a				
Eu 152		8			Other b/g				
Eu 154	9.66E-09	C C 2			**Total a**	**1.02E-05**	**C C 2**	**0**	
Eu 155		8			**Total b/g**	**3.85E-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