WASTE STREAM 9C54 Catalyst

SITE Dungeness A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	1.5 m³
Total future arisings:		0 m³
Total waste volume:		1.5 m³

Comment on volumes: The volume of catalyst has been determined from the internal volumes of the gas recombination units. The station ceased generation on 31/12/2006.

Uncertainty factors on volumes:

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

WASTE SOURCE Catalyst from the recombination units in the reactor gas drier system.

PHYSICAL CHARACTERISTICS

General description: Balls and pellets (~100%) from the recombination unit of the reactor gas drier system.

Physical components (%vol): Balls and pellets (~100%). The pellets are 3mm in diameter and 3mm long.

Sealed sources: -

Bulk density (t/m³): ~0.8

Comment on density: The bulk density range has not been assessed

CHEMICAL COMPOSITION

General description and components (%wt): High temperature ceramic balls (~10%), platinum on alumina catalyst pellets (>88%) and materials deposited on the catalyst (<2%).

Chemical state: Neutral

Chemical form of radionuclides: H-3: Tritium is present as tritiated water adsorbed in the catalyst balls and pellets.
Pu: The chemical form of the plutonium isotopes has not been assessed.

Metals and alloys (%wt): -

Stainless steel.....	0
Other ferrous metals.....	0
Iron.....	
Aluminium.....	
Beryllium.....	
Cobalt.....	
Copper.....	0
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	
Titanium.....	
Uranium.....	
Zinc.....	0
Zircaloy/Zirconium.....	0
Other metals.....	

Organics (%wt): Organic material that has been adsorbed by the waste during its operational life.

WASTE STREAM	9C54 Catalyst		
	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	<2.0	Materials deposited on the catalyst
Other materials (%wt):	-		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs	NE	
	Soil	0	
	Brick/Stone/Rubble	0	
	Cementitious material	0	
	Sand		
	Glass/Ceramics	10.0	High temperature ceramic balls
	Graphite	NE	
	Desiccants/Catalysts	88.0	Platinum on alumina catalyst pellets (>88%)
	Asbestos	0	
	Non/low friable		
	Moderately friable		
	Highly friable		
	Free aqueous liquids	NE	
	Free non-aqueous liquids	0	
	Powder/Ash		
Inorganic anions (%wt):	The inorganic anion content of the waste has not been assessed.		

WASTE STREAM	9C54 Catalyst

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

Materials of interest for waste acceptance criteria: No material likely to present a fire or other non-radiological hazard has been identified.

Combustible metals	0
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	0
Active particles	
Soluble solids as bulk chemical compounds	

Hazardous substances / non hazardous pollutants: -

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

WASTE STREAM 9C54 Catalyst

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):

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids……

Other organic complexants.....

Total complexing agents.....

LAW TREATMENT, PACKAGING AND DISPOSAL

Waste that is currently ILW: -

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

Treatment	On-site / Off site	Stream volume %
Low force compaction Supercompaction (HFC) Incineration Solidification Decontamination Metal treatment Size reduction Decay storage Recyling / reuse Other / various None	Off-site	100.0

Comment on planned treatments: waste will be washed and burnt

WASTE STREAM 9C54 Catalyst

Disposal Routes:

Disposal Route	Stream volume %
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

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 m³	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: -

Waste Consigned to the LLW Repository:

Container voidage: -

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

WASTE STREAM	9C54 Catalyst
Source:	The catalyst is a part of the reactor gas conditioning plant and, therefore, will be contaminated with fission products and actinides. The main source of activity is expected to be tritium.
Uncertainty:	Specific activity is a function of station operating history.
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:	Estimated from available desiccant and catalyst data.
Other information:	-

WASTE STREAM 9C54 Catalyst

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	6.03E-02	C C 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	2.00E-04	C C 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1E-04	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		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	<6.08E-06	C 3			Pb 210		8		
Co 60	2.75E-06	C C 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	2.82E-06	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	<8.06E-08	C 3			Th 227		8		
Zr 93		8			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m		8			Th 232		8		
Nb 94		8			Th 234		8		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99		8			U 232		8		
Ru 106	<1.23E-09	C 3			U 233		8		
Pd 107		8			U 234		8		
Ag 108m		8			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238		8		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	9.35E-09	C C 2		
Sn 123		8			Pu 239	1E-08	C C 2		
Sn 126		8			Pu 240	2E-08	C C 2		
Sb 125	<1.04E-08	C 3			Pu 241	6.49E-07	C C 2		
Sb 126		8			Pu 242		8		
Te 125m	<2.59E-09	C 3			Am 241	4.12E-08	C C 2		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134	<3.91E-09	C 3			Cm 242		8		
Cs 135		8			Cm 243		8		
Cs 137	2.44E-07	C C 2			Cm 244	1.42E-09	C C 2		
Ba 133	3.32E-08	C C 2			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	<9.28E-09	C 3			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152	<1.26E-07	C 3			Other b/g				
Eu 154	<4.84E-08	C 3			**Total a**	**8.20E-08**	**C C 2**	**0**	
Eu 155	<2.23E-08	C 3			**Total b/g**	**6.06E-02**	**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