WASTE STREAM 9C47 Nimonic Springs and Thermocouples

SITE Dungeness A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

WASTE VOLUMES

Stocks:	At 1.4.2013.....	~0.1 m³
Total future arisings:		0 m³
Total waste volume:		0.1 m³

Comment on volumes: There will be no further arisings of this waste stream as the retrieval of waste from the splitter vaults has been completed. Nimonic springs and thermocouples separated from the waste in former streams 9C24, 9C25, 9C26 and 9C27.

Uncertainity factors on volumes:

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

WASTE SOURCE Nimonic springs and thermocouples separated from the Magnox splitter waste during the dissolution of that stream in the Magnox Dissolution Plant.

PHYSICAL CHARACTERISTICS

General description: The waste consists of 3 canisters containing 714 nimonic springs, 95 thermocouples without cables or sheaths and 28 wires/end caps. There is also one shielded container with 113 nimonic springs and 1 thermocouple.

Physical components (%wt): Nimonic springs (~90%), thermocouples and wires/end caps (~10%).

Bulk density (t/m³): ~1.5

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Nimonic springs (~90%), thermocouples and wires/end caps (~10%).

Chemical state: The waste is neither oxidising, reducing, acidic nor alkaline.

Chemical form of radionuclides: H-3: Tritium will probably be present as surface contamination, possibly as water or perhaps as other inorganic or organic compounds.
C-14: The chemical form of carbon has not been determined.
Tc-99: The chemical form of technetium has not been determined.
U: Chemical form of uranium isotopes has not been determined but may be uranium oxides.
Np: The chemical form of neptunium has not been determined.
Pu: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): -

Stainless steel.....	0	Bronze.....	0
Other ferrous metals.....	0	Inconel.....	~10.0
Aluminium.....	0	Nimonic.....	~90.0
Copper.....	0	Stellite.....	0
Lead.....	0	Boral.....	0
Zinc.....	0	Dural.....	0
Magnox/Magnesium.....	0	Monel.....	0
Zircaloy.....	0	Uranium.....	NE
Brass.....	0	Beryllium.....	
		Other metals (below).....	0

Other metals: -

Inorganic anions (%wt): Inorganic anions are not expected to be present at greater than trace concentrations.

Fluoride.....	TR	Nitrate.....	TR
Chloride.....	TR	Nitrite.....	TR
Iodide.....	0	Phosphate.....	TR
Cyanide.....	0	Sulphate.....	TR
Carbonate.....	TR	Sulphide.....	0

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Listed substances:	Not present.
Hazardous and problematic materials (%wt):	No materials likely to pose a fire or other non-radiological hazard have been identified.

Combustible metals	0	Strong oxidising agents	0
Low flash point liquids	0	Pyrophoric materials	0
Explosive materials	0	Generating toxic gases	0
Phosphorus	0	Reacting with water	0
Hydrides	0	Asbestos	0
Putrescible wastes	0	Free aqueous liquids	TR
Biological etc. materials	0	Free non-aqueous liquids	0
Powder	0		

Asbestos types and proportions:	-
Complexing agents (%wt):	Not yet determined.

Complexing agents	NE

Organics (%wt):	There may be organic materials present in trace quantities.

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
Other organics	TR

Halogenated plastics and rubber (%wt):	There are no halogenated plastics or rubbers present with the waste.
Other materials (%wt):	Traces of graphite may be present.

Inorganic ion exchange materials	0
Inorganic sludges and flocs	0
Soil	0
Rubble	0
Concrete, cement and sand	0
Glass	0
Ceramics	0
Graphite	TR

PACKAGING AND CONDITIONING

Conditioning method:	-
Plant Name:	-
Location:	Dungeness A Site
Plant startup date:	2015
Total capacity (m^3/y incoming waste):	-
Target start date for packaging this stream:	2015
Throughput for this stream (m^3/y incoming waste):	-
Other information:	-

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Likely container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Container displacement volume (m^3)
Other (MOSAIK with 80mm shielding. Displacement volume 1.32m3.)	100.0	~0.219	0.244	

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: -

RADIOACTIVITY

Source: Nimonic springs originally incorporated into Magnox fuel element top end fittings and removed during fuel element desplittering. There will be activation products in the Nimonic and contamination by fission products and actinides.

Accuracy: Specific activity is a function of Station operating history. The values quoted are indicative of the activities that might be expected.

Definition of total alpha and total beta/gamma: Totals shown on table of radionuclide activities are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma.'

Measurement of specific activities: The Nimonic springs are expected to be of high activity. Induced activity has been calculated and fission product and actinide contamination levels have been based upon measurements of the activity of Magnox samples.

Other information: Other beta/gamma nuclides in stock include (in TBq/m3) : Al26 (2E-4).

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Nuclide	Average specific activity, TBq/m³				Nuclide	Average specific activity, TBq/m³			
	Waste at 1.4.2013	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2013	Bands and Code	Future arisings	Bands and Code
H 3	2.14E-03	C C 2			Ho 163		8		
Be 10		8			Ho 166m		8		
C 14	6E-06	C C 2			Tm 170		8		
Cl 36	2E-04	C C 2			Tm 171		8		
Ar 39		8			Lu 174		8		
Ar 42		8			Lu 176		8		
K 40		8			Hf 178n		8		
Ca 41		8			Hf 182		8		
Mn 53		8			Pt 193		8		
Mn 54		8			Tl 204		8		
Fe 55	8.56E-02	C C 2			Pb 205		8		
Co 60	2.27E+01	C C 2			Pb 210		8		
Ni 59	1E+01	C C 2			Bi 208		8		
Ni 63	9.59E+02	C C 2			Bi 210m		8		
Zn 65		8			Po 210		8		
Se 79		8			Ra 223		8		
Kr 81		8			Ra 225		8		
Kr 85		8			Ra 226		8		
Rb 87		8			Ra 228		8		
Sr 90	2.6E-05	C C 2			Ac 227		8		
Zr 93	2E-09	C C 2			Th 227		8		
Nb 91		8			Th 228		8		
Nb 92		8			Th 229		8		
Nb 93m		8			Th 230		8		
Nb 94		8			Th 232		8		
Mo 93		8			Th 234	3E-08	C C 2		
Tc 97		8			Pa 231		8		
Tc 99	1E-08	C C 2			Pa 233	4.1E-09	C C 2		
Ru 106		8			U 232		8		
Pd 107		8			U 233		8		
Ag 108m		8			U 234	3.04E-08	C C 2		
Ag 110m		8			U 235		8		
Cd 109		8			U 236	4E-09	C C 2		
Cd 113m		8			U 238	3E-08	C C 2		
Sn 119m		8			Np 237	4.1E-09	C C 2		
Sn 121m		8			Pu 236		8		
Sn 123		8			Pu 238	1.9E-05	C C 2		
Sn 126		8			Pu 239	1E-05	C C 2		
Sb 125		8			Pu 240	2E-05	C C 2		
Sb 126		8			Pu 241	2.99E-04	C C 2		
Te 125m		8			Pu 242	1E-08	C C 2		
Te 127m		8			Am 241	5.28E-05	C C 2		
I 129		8			Am 242m	8.74E-08	C C 2		
Cs 134		8			Am 243	3E-08	C C 2		
Cs 135		8			Cm 242	7.22E-08	C C 2		
Cs 137	4.36E-05	C C 2			Cm 243	1.74E-08	C C 2		
Ba 133		8			Cm 244	2.38E-07	C C 2		
La 137		8			Cm 245		8		
La 138		8			Cm 246		8		
Ce 144		8			Cm 248		8		
Pm 145		8			Cf 249		8		
Pm 147	8.19E-09	C C 2			Cf 250		8		
Sm 147		8			Cf 251		8		
Sm 151	7.63E-08	C C 2			Cf 252		8		
Eu 152		8			Other a		8		
Eu 154	1.23E-07	C C 2			Other b/g	2E-04	C C 2		
Eu 155	4.32E-09	C C 2			**Total a**	**1.02E-04**	**C C 2**		
Gd 153		8			**Total b/g**	**9.92E+02**	**C C 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 the average specific activity.

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