WASTE STREAM 9C47 Miscellaneous Activated Components (including Nimonic Springs, Thermocouples, Nose Cones and End Caps)

SITE	Dungeness A
SITE OWNER	Nuclear Decommissioning Authority
WASTE CUSTODIAN	Magnox Limited
WASTE TYPE	ILW
Is the waste subject to Scottish Policy:	No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	~0.3 m^3
Total future arisings:		0 m^3
Total waste volume:		0.3 m^3

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. It has been estimated that repackaging of the pathfinder MOSAIK will result in two MAC baskets filled for disposal (0.01702m3). The quantity of MAC packages is estimated at 35 baskets from Ponds and MXD (0.29785m3).

Uncertainty 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%).
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m^3):	~1.5
Comment on density:	-

CHEMICAL COMPOSITION

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

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	0		
Iron.....			
Aluminium.....	0		
Beryllium.....			

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Cobalt		
Copper	0	
Lead	0	
Magnox/Magnesium	0	
Nickel	100.0	90% Nimonic, 10% Inconel
Titanium		
Uranium		
Zinc	0	
Zircaloy/Zirconium	0	
Other metals	0	

Organics (%wt): There may be organic materials present in trace quantities. There are no halogenated plastics or rubbers present with the waste.

	(%wt)	Type(s) and comment	% of total C14 activity
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): Traces of graphite may be present.

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	0		
Inorganic sludges and flocs	0		
Soil	0		
Brick/Stone/Rubble	0		
Cementitious material	0		
Sand			
Glass/Ceramics	0		
Graphite	TR		

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Desiccants/Catalysts	
Asbestos	0
Non/low friable	
Moderately friable	
Highly friable	
Free aqueous liquids	TR
Free non-aqueous liquids	0
Powder/Ash	0

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

	(%wt)	Type(s) and comment
Fluoride	TR	
Chloride	TR	
Iodide	0	
Cyanide	0	
Carbonate	TR	
Nitrate	TR	
Nitrite	TR	
Phosphate	TR	
Sulphate	TR	
Sulphide	0	

Materials of interest for waste acceptance criteria: No materials likely to pose a fire or other non-radiological hazard have been identified.

	(%wt)	Type(s) and comment
Combustible metals	0	
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		
Corrosive materials	0	
Pyrophoric materials	0	
Generating toxic gases	0	
Reacting with water	0	
Higher activity particles		
Soluble solids as bulk chemical compounds		

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Hazardous substances / non hazardous pollutants: none expected

	(%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.....		
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):

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids…….		
Other organic complexants.....		
Total complexing agents.....	NE	

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Potential for the waste to contain discrete items: Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs; Stainless items assumed DIs (MAC also includes nimonics, known DIs)

PACKAGING AND CONDITIONING

Conditioning method: Waste loaded into Shielded Transfer Pots (STPs), up to 8 STPs to be placed into each Mosaik

Plant Name: -

Location: Dungeness A Site

Plant startup date: -

Total capacity (m^3/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m^3/y incoming waste): -

Other information: -

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages
500 l RS drum (50mm Pb)	100.0	0.068	0.316	5

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: -

Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

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.

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

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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:	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:	-

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	1.29E-03	C C 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	6.00E-06	C C 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	2E-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	8.74E-03	C C 2			Pb 210		8		
Co 60	6.95E+00	C C 2			Bi 208		8		
Ni 59	1E+01	C C 2			Bi 210m		8		
Ni 63	9.00E+02	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	2.10E-05	C C 2			Th 227		8		
Zr 93	2E-09	C C 2			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	3E-08	C C 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233	4.26E-09	C C 2		
Tc 99	1E-08	C C 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	3.09E-08	C C 2		
Ag 108m		8			U 235		8		
Ag 110m		8			U 236	4.00E-09	C C 2		
Cd 109		8			U 238	3E-08	C C 2		
Cd 113m		8			Np 237	4.26E-09	C C 2		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	1.78E-05	C C 2		
Sn 123		8			Pu 239	1.00E-05	C C 2		
Sn 126		8			Pu 240	2.00E-05	C C 2		
Sb 125		8			Pu 241	1.94E-04	C C 2		
Sb 126		8			Pu 242	1E-08	C C 2		
Te 125m		8			Am 241	5.55E-05	C C 2		
Te 127m		8			Am 242m	8.36E-08	C C 2		
I 129		8			Am 243	3.00E-08	C C 2		
Cs 134		8			Cm 242	6.90E-08	C C 2		
Cs 135		8			Cm 243	1.41E-08	C C 2		
Cs 137	3.55E-05	C C 2			Cm 244	1.69E-07	C C 2		
Ba 133		8			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		8			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	7.12E-08	C C 2			Other a				
Eu 152		8			Other b/g				
Eu 154	5.95E-08	C C 2			**Total a**	**1.04E-04**	**C C 2**	**0**	
Eu 155	1.19E-09	C C 2			**Total b/g**	**9.17E+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