WASTE STREAM	9E41	FED Nimonic

SITE Oldbury

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m^3)
Stocks: At 1.4.2025	= 0.1
Future arisings:	
Total future arisings:	**0.0**
Total waste volume:	**0.1**

OR

Conditioned (m^3)	Packaged (m^3)

Number of waste packages in stock: At 1.4.2025…… - packages

Comment on arising rates: -

Additional information on quantities: Fuel element spiders (to which Nimonic springs are attached) have not been accumulated on site in significant numbers since the commissioning of a new desplittering machine in 1983. Following this, Fuel elements were then sent to Sellafield with the spiders containing the Nimonic springs attached.

Uncertainty factors on volumes:

Stock (upper):	x 1.20	Arisings (upper):	x -
Stock (lower):	x 0.80	Arisings (lower):	x -

WASTE SOURCE Nimonic springs from polyzonal Magnox fuel elements.

PHYSICAL CHARACTERISTICS

General description: Nimonic springs originally incorporated into Magnox fuel element top end fittings and removed during fuel element desplittering. There are no large items present in the waste which may require special handling.

Changes since waste generated: -

Bulk density (t/m³): = 1.5

Comment on density: The density given is based on a packing factor of 5 times the displacement volume of the material. (The density will be only 0.4 assuming a packing factor of 5 times the cylindrical volume of a spring). The density range is not estimated.

CHEMICAL COMPOSITION

General description and components (%wt): Activated Nimonic (~100%) which may be contaminated by fission products and actinides.

Chemical state: Neutral

Sheet metal proportion / thickness: No bulk or sheet metal items present.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel……	= 0	-	
Other ferrous metals……	= 0	-	
Iron……		-	
Aluminium……	= 0	-	
Beryllium……	0	-	
Cobalt……		-	
Copper……	= 0	-	
Lead……	= 0	-	
Magnox/Magnesium……	TR	-	
Nickel……	~ 100.0	100% present as Nimonic alloy (type 80A).	
Titanium……		-	
Uranium……		-	
Zinc……	= 0	-	
Zircaloy/Zirconium……	= 0	-	
Other metals……	= 0	No "other" metals present.	

Organics (%wt):

	(%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):

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

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%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:

	(%wt)	Type(s) and comment
Combustible metals	TR	-
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	TR	-
Higher activity particles		-
Soluble solids as bulk chemical compounds		-

Hazardous substances / 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		-
Mercury compounds		-
Others		-

Complexing agents (%wt): Yes

	(%wt)	Type(s) and comment
EDTA		-
DPTA		-
NTA		-
Polycarboxylic acids		-
Other organic complexants		-
Total complexing agents	TR	-

Physical components:

	Number	Type(s) and comment
Sources		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1		-
EEE Type 2		-
EEE Type 3		-
EEE Type 4		-
EEE Type 5		-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction Decay storage Low force compaction Supercompaction (HFC) Incineration Drying/dewatering/liquid separation Tie down/fixatives/strippable coating/painting application Decontamination Metal treatment Recycling / reuse Thermal treatment, including vitrification Encapsulation Polymer encapsulation Other physical treatment Other chemical treatment Containerisation Treatment not yet determined None	On-site	100.0

Comments on planned treatments: -

Conditioning method: -

Conditioning plants:

Plant Name	Location
OLD AVDS	Oldbury

Likely conditioning matrix: -

Further information on the conditioning matrix: -

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
500 l RS drum (0mm Pb)	100.0	0.03	0.49	4	-

Range in container waste loading: The number of packages required remains uncertain, as it is heavily dependent on the number of top-end fittings etc. that are co-packaged with the springs and the packing efficiency of the waste.

Other information on packaging and conditioning: Waste container and box numbers have been updated to reflect the information in LTP. However this is under review and will be updated when more data is supplied by the ILW team.

Conditioned density (t/m^3): -
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m^3	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	100.0		
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility:

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	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. The Nimonic springs are expected to be of high activity.

Measurement of radioactivities: Induced activity has been calculated and fission product and actinide contamination levels have been based upon measurements of the activity of Magnox samples.

Chemical form of radionuclides:

H-3: Trace amounts of tritium will be present as surface contamination.
C-14: Trace amounts of carbon 14 will be present in graphite.
Cl-36: Trace amounts of chlorine 36 will be present in graphite.
Se-79: The selenium content is insignificant.
Tc-99: The technetium content is insignificant.
I-129: -
Ra: Radium isotope content is insignificant.
Th: Thorium isotope content is insignificant.
U: Trace contamination possibly as uranium metal or uranium oxides.
Np: The neptunium content is insignificant.
Pu: Trace contamination possibly as plutonium oxides.

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	2.23E-03	C C 2			Gd 153		8		
Be 10	5.69E-09	C C 2			Ho 163	1.01E-07	C C 2		
C 14	1.87E-01	C C 2			Ho 166m	2.27E-06	C C 2		
Na 22		8			Tm 170		8		
Al 26	2.33E-08	C C 2			Tm 171		8		
Cl 36	1.49E-04	C C 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n	4.41E-09	C C 2		
K 40		8			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53	8.68E-09	C C 2			Tl 204	8.02E-07	C C 2		
Mn 54		8			Pb 205		8		
Fe 55	7.61E-04	C C 2			Pb 210		8		
Co 60	9.53E+00	C C 2			Bi 208		8		
Ni 59	9.83E+00	C C 2			Bi 210m		8		
Ni 63	8.61E+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	4.19E-04	C C 2			Th 227		8		
Zr 93	7.42E-05	C C 2			Th 228		8		
Nb 91	1.02E-08	C C 2			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	8.32E-05	C C 2			Th 232		8		
Nb 94	7.71E-06	C C 2			Th 234		8		
Mo 93	1.03E-06	C C 2			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	1.39E-07	C C 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234		8		
Ag 108m	6.26E-05	C C 2			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238		8		
Cd 113m	4.12E-04	C C 2			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m	1.64E-06	C C 2			Pu 238	2.55E-06	C C 2		
Sn 123		8			Pu 239	5.79E-06	C C 2		
Sn 126		8			Pu 240	5.95E-06	C C 2		
Sb 125		8			Pu 241	5.08E-05	C C 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	2.38E-05	C C 2		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134		8			Cm 242		8		
Cs 135		8			Cm 243	3.68E-09	C C 2		
Cs 137	2.25E-04	C C 2			Cm 244	6.22E-08	C C 2		
Ba 133	2.82E-06	C C 2			Cm 245		8		
La 137	9.72E-09	C C 2			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145	4.59E-07	C C 2			Cf 250		8		
Pm 147	2.25E-08	C C 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	8.62E-05	C C 2			Unsp a				
Eu 152	6.81E-07	C C 2			Unsp b/g				
Eu 154	1.42E-06	C C 2			**Total a**	**3.81E-05**	*	**0**	*
Eu 155	1.09E-06	C C 2			**Total b/g**	**8.81E+02**	*	**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 the 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
* Total calculated from the 114 declared radionuclides