

WASTE STREAM	9A44/C	Miscellaneous Activated Components
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SITE Berkeley

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025		= 6.4	14.4
Future arisings:				0.0
				0.0
Total future arisings:			0.0	0.0
Total waste volume:			6.4	14.4

Number of waste packages in stock: At 1.4.2025..... 11 packages

Comment on arising rates: -

Additional information on quantities: Calculated using total weight from package records and density of wasteform

Uncertainty factors on volumes: Stock (upper): x 1.00 Arisings (upper): x -
Stock (lower): x 1.00 Arisings (lower): x -

WASTE SOURCE Irradiated components removed from the reactors.

PHYSICAL CHARACTERISTICS

General description: The waste comprises mainly charge chutes, a thermocouple chute and a number of control rods, removed from reactor cores. Many of the control rods have been highly activated at one end. There are also pieces of the Mortuary Mechanism Cradle Gate assembly resting on top of this waste pile. These sections are identified in Waste Stream 9A81. The waste consists of large, heavy items. The control rods are 8.5m in length and have a mass of approximately 80kg each. The charge chutes and trailing lead thermocouple chutes are 12m in length and have masses of approximately 1780kg and 1270kg respectively.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.5

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): The waste is principally steel (~100%). There may also be surface water and oil, cutting debris and secondary wastes.

Chemical state: Neutral

Sheet metal proportion / thickness: All of the waste is engineered components.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 45.4	EN58B Stainless steel	
Other ferrous metals.....	~ 55.0	EN3 Mild steel (0.9% wt); 4.25% Boron Cr steel (45.3% wt); EN56D 13% Cr steel (8.3% wt); 16/4/1 Tungsten steel (0.3% wt); Cast Iron (0.2%)	
Iron.....	-	-	
Aluminium.....	NE	-	
Beryllium.....	TR	-	
Cobalt.....	-	-	
Copper.....	NE	-	
Lead.....	NE	-	
Magnox/Magnesium.....	NE	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	NE	The presence of "other" metals has not been assessed.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose...	= 0	-	
Paper, cotton...	= 0	-	
Wood...	= 0	-	
Halogenated plastics...	= 0	-	
Total non-halogenated plastics...	= 0	There are no halogenated rubbers or plastics present.	
Condensation polymers...	= 0	-	
Others...	= 0	-	
Organic ion exchange materials...	= 0	-	
Total rubber...	= 0	There are no halogenated rubbers or plastics present.	
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...	-	-	

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...	~ 0.20	iron shot concrete	
Sand...	-	-	
Glass/Ceramics...	= 0	-	
Graphite...	TR	-	
Desiccants/Catalysts...	-	-	
Asbestos...	= 0	-	
Non/low friable...	-	-	
Moderately friable...	-	-	
Highly friable...	-	-	
Free aqueous liquids...	= 0	-	
Free non-aqueous liquids...	TR	-	
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...	TR	-
Cyanide...	= 0	-
Carbonate...	TR	-
Nitrate...	TR	-
Nitrite...	TR	-
Phosphate...	TR	-
Sulphate...	TR	-
Sulphide...	TR	-

Materials of interest for waste acceptance criteria:

	(%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...	-	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	0	-
Benzene.....		-
Chlorinated solvents.....		-
Formaldehyde.....		-
Organometallics.....		-
Phenol.....		-
Styrene.....		-
Tri-butyl phosphate.....		-
Other organophosphates.....		-
Vinyl chloride.....		-
Arsenic.....		-
Barium.....		-
Boron.....		-
Boron (in Boral).....		-
Boron (non-Boral).....		-
Cadmium.....		-
Caesium.....		-
Selenium.....		-
Chromium.....		-
Molybdenum.....		-
Thallium.....		-
Tin.....		-
Vanadium.....		-
Mercury compounds.....		-
Others.....		-

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....	= 0	-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....		-
Total complexing agents.....		-

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		

Comments on planned treatments:

-

Conditioning method:

Drying has taken place using AVDS, waste stored in mild steel baskets.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

Further information on the conditioning matrix:

-

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	500 l RS drum (50mm Pb)	45.0	0.58	0.58	5	-
	500 l RS drum (0mm Pb)	55.0	0.60	0.60	6	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): 1.5
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	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: Irradiated components removed from the reactor. Control rods are likely to be components of high activity.

Uncertainty: Specific activity is a function of station operating history. The values quoted are based on decayed 2006 characterisation data, scaled to Co-60 content of each waste package and summed to output waste stream total.

Measurement of radioactivities: Estimates are based upon theoretical assessments.

Chemical form of radionuclides:

H-3: Tritium may be incorporated in the waste or present as surface contamination in the form of inorganic or organic compounds.

C-14: The chemical form of carbon 14 has not been determined but may be graphite.

Cl-36: The chemical form of chlorine 36 has not been determined.

Se-79: The chemical form of selenium-79 has not been determined.

Tc-99: The chemical form of technetium-99 has not been determined.

I-129: -

Ra: The chemical form of radium isotopes have not been determined.

Th: The chemical form of thorium isotopes have not been determined.

U: Chemical form of uranium isotopes has not been determined but may be uranium oxides.

Np: The chemical form of neptunium isotopes have not been determined.

Pu: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

WASTE STREAM 9A44/C Miscellaneous Activated Components									
Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	5.57E-04	C C 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	9.12E-02	C C 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	2.26E-06	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			Ti 204		8		
Mn 54		8			Pb 205		8		
Fe 55	1.17E-03	C C 2			Pb 210		8		
Co 60	2.94E-01	C C 1			Bi 208		8		
Ni 59	1.13E-01	C C 2			Bi 210m		8		
Ni 63	8.89E+00	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			Th 227		8		
Zr 93		8			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	9.43E-03	C C 2			Th 232		8		
Nb 94	8.83E-05	C C 2			Th 234		8		
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		8		
Ag 108m		8			U 235	1.63E-09	C C 2		
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	2.20E-05	C C 2		
Sn 123		8			Pu 239	2.81E-05	C C 2		
Sn 126		8			Pu 240	3.37E-05	C C 2		
Sb 125		8			Pu 241	2.23E-04	C C 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	1.07E-04	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		8		
Cs 137	3.43E-04	C C 2			Cm 244		8		
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		8			Unsp a				
Eu 152		8			Unsp b/g				
Eu 154		8			Total a	1.90E-04	*	0	*
Eu 155		8			Total b/g	9.40E+00	*	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