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**WASTE NUCLEAR SUBSTANCE LICENCE
PORT HOPE LONG-TERM LOW-LEVEL RADIOACTIVE
WASTE MANAGEMENT PROJECT**

I) LICENCE NUMBER: WNSL-W1-2310.00/2014

II) LICENSEE: Pursuant to section 24 of the *Nuclear Safety and Control Act*, this licence is issued to:

**Atomic Energy of Canada Limited
2251 Speakman Drive
Mississauga, Ontario
L5K 1B2**

III) LICENCE PERIOD: This licence is valid from the effective date of the land transfer of the Welcome Waste Management Facility property as set out in the “Agreement of Purchase and Sale” between Her Majesty the Queen In Right Of Canada and Cameco Corporation and Canada Eldor Inc. and remains in effect until **December 31, 2014** unless otherwise suspended, amended, revoked or replaced.

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee, Atomic Energy of Canada Limited (hereinafter “AECL”), to:

- a) possess, manage and store nuclear substances that are required for, associated with or arise from Phase 1¹ activities associated with the Port Hope Long-Term Low-Level Radioactive Waste Management Project, located at the Welcome Waste Management Facility which is more precisely described in Appendix A and;

¹ - Phase 1 activities are defined as those activities related to the continued operation of the Welcome Waste Management Facility associated with ongoing care and maintenance.
- Phase 2 on-site activities are those activities related to the continued operation of the Welcome Waste Management Facility and those related to the redevelopment of the facility into the Port Hope Long-Term Waste Management Facility.
- Phase 2 off-site activities are those activities related to the operation of the Port Hope Long-Term Waste Management Facility, the continued development of the Port Hope Long-Term Waste Management Facility and off-site remedial activities associated with the project.
- Phase 3 activities are those activities related to the post-closure operations of the Port Hope Long-Term Waste Management Facility associated with ongoing care and maintenance.

- b) possess², package, transfer, manage and store the nuclear substances except Category I, II and III nuclear- material as defined in section 1 of the *Nuclear Security Regulations*, that are required for, associated with or arise from Phases 2 and 3 of the Port Hope Long-Term Low-Level Radioactive Waste Management Project, located at the Port Hope Long-Term Waste Management Facility more precisely described in Appendix A.

V) CONDITIONS:

1. GENERAL

- 1.1 The contents of the appendices attached to this licence form part of this licence.
- 1.2 The licensee shall not make any change to any of the documents listed in the Appendices to this licence except in accordance with condition 3.1 of this licence.
- 1.3 The licensee shall immediately provide the Commission or a person authorized by the Commission with evidence that the transfer of lands associated with the "Agreement of Purchase and Sale" between Her Majesty the Queen In Right Of Canada and Cameco Corporation and Canada Eldor Inc. has been executed.
- 1.4 The licensee shall have accepted by the Commission the following documents prior to proceeding with the following project phases:
- Phase 2 on-site activities: the documents identified in section 1 of Appendix C
 - Phase 2 off-site activities: the documents identified in section 2 of Appendix C
 - Phase 3 long-term operations: the documents identified in section 3 of Appendix C
- 1.5 The licensee shall adhere to clean-up criteria set out in Appendix D to this licence for Phase 2 on-site and off-site activities.

2. OPERATIONS

- 2.1 The licensee shall carry out the activities described in Part IV of this licence for the purposes and according to the methods, procedures and within the limits described in the documents listed in Appendix B, C and D to this licence, subject to any approved modifications made pursuant to condition 3.1 of this licence.
- 2.2 The licensee shall limit the inventory of nuclear substances under this licence to less than 100×10^{12} Bq in a volume not exceeding 2.0 million m³.

²For clarity, possession of nuclear substances by AECL during Phase 2 off-site activities at Port Hope unlicensed sites is considered to occur at the moment when AECL removes such substances from their place of origin in accordance with project activities. It is at this point that they are considered to come under authority of this licence.

2.3 Action Levels:

The licensee shall establish acceptable action levels as set out under Section 6 of the *Radiation Protection Regulations* associated with the operation of the following facilities and within the period identified:

- Welcome Waste Management Facility effluent treatment plant: prior to December 31, 2010
- Port Hope Long-Term Waste Management Facility effluent treatment plant: prior to commissioning and operating new effluent treatment processes.

3. MODIFICATIONS

3.1 The licensee shall not make modifications to, or deviate from the design, operating conditions, purposes, methods, procedures, limits or equipment described in the documents referred to in the appendices of this licence, that would render inaccurate the information contained in those documents or otherwise adversely affect the safe conduct of the activities described in Part IV of this licence, without the prior written approval of the Commission or a person authorized by the Commission.

4. REPORTING

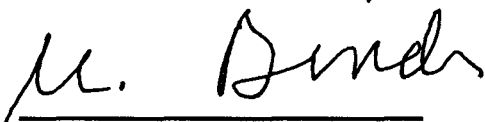
4.1 The licensee shall, by April 1 of each calendar year, submit to the Commission or a person authorized by the Commission, a written report on the activities associated with the Port Hope Long-Term Low-Level Radioactive Waste Management Project for the period of January 1 to December 31 of the previous calendar year, containing information on;

- a) the conduct of the licensed activities completed;
- b) the results of the monitoring programs described in the documents listed in Appendix B and C of the licence and any approved modifications pursuant to condition 3.1 of this licence;
- c) a summary description of events reported to the Commission or a person authorized by the Commission pursuant to section 29 of the *General Nuclear Safety and Control Regulations*; and
- d) a summary description of any changes in the methods, procedures and equipment used to carry out the licensed activities.

4.2 The licensee shall, on a quarterly basis, submit to the Commission or a person authorized by the Commission, a written report containing the results of the effluent monitoring program as specified in the documents in Appendix B of this licence.

- 4.3 The licensee shall, upon completion of any of the following project activities, submit to the Commission or a person authorized by the Commission, a written report containing a summary description of works completed:
- Phase 2 on-site activities
 - Phase 2 off-site activities
 - Final closure of the Port Hope Long-Term Waste Management Facility
- 4.4 The licensee shall submit to the Commission or a person authorized by the Commission a report on the exceedance of an action level within 10 days of becoming aware of the situation. This report shall contain the following information:
- a) the date, time, duration and circumstances of the action level exceedance; and
 - b) the measures taken to restore the effectiveness of the effluent treatment process.
- 4.5 The licensee shall immediately notify the Commission or a person authorized by the Commission of the exceedance of a discharge limit as set out in Appendix B or C to this licence and within 21 days file a written report on the situation containing the following information:
- a) the date, time, location, and description of the effluent discharge limit exceeded;
 - b) a description of the investigation conducted and the cause established for exceeding the effluent discharge limit;
 - c) the effects on the environment and the health and safety of persons that have resulted or may result from the situation; and
 - d) the actions taken to restore the effluent concentrations to within the effluent discharge limits set out in Appendix B or C to this licence.
- 4.6 The licensee shall notify the Commission, or a person authorized by the Commission in writing, within 10 days of the measurement of a uranium concentration greater than 200 micrograms per litre in the effluent discharge at the Welcome Waste Management Facility.

SIGNED at OTTAWA, ONTARIO this 16th day of October, 2009.



Michael Binder, President
On behalf of the Canadian Nuclear Safety Commission

APPENDIX A

Welcome Waste Management Facility

The Welcome Waste Management Facility is located on lands described as all that portion of Lots 13 and 14, Concession 2, in the Municipality of Hope, in the County of Northumberland, designated as Parts 1 and 2 on a reference plan deposited in the Land Registry Office for the Registry Division of Port Hope as Plan 9R-734. The Welcome Waste Management Facility is located within the perimeter of the Port Hope Long-Term Waste Management Facility

Port Hope Long-Term Waste Management Facility

The Port Hope Long-Term Waste Management Facility will be located in Ward 2 of the Municipality of Port Hope, in the County of Northumberland; bordered on the west by Brand Road, on the north by Highway 401, on the east by Baulch Road and on the south by rural and residential lots on the north side of Marsh Road. The location of the Long-Term Waste Management Facility is shown on the following figure.



APPENDIX B

References and Effluent Limits Associated with Phase 1 of the Port Hope Long-Term Low-Level Radioactive Waste Management Project

1. Phase 1 References: Continued Operation of the Welcome Waste Management Facility

- “Facility Licensing Manual, Welcome Waste Management Facility, Revision 3, October 23, 2002, Cameco Corporation”.

The purpose of the Facility Licensing Manual is to define how the Welcome Waste Management Facility will be operated during Phase 1 activities (representing ongoing care and maintenance).

- Licensing Manual – Information in support of the Port Hope Long-Term Low-Level Radioactive Waste Management Project licence application, Revision 1, AECL, June 16 2009

The purpose of the Licensing Manual is to provide the information necessary to support the application for a Waste Nuclear Substance Licence under the Nuclear Safety and Control Act. The Licensing Manual sets out timelines for future submissions and hold-points related to the nature of the work to be performed. The manual sets out proposed approaches to communications, environmental protection, security, occupational health and safety, radiation protection, training and quality assurance. It also provides reference to the documentation that describes AECL programs under which work will be executed, and to additional programs that will be developed specific to the Port Hope Long-Term Low-Level Radioactive Waste Management Project.

2. Phase 1 Effluent Limits for the Welcome Waste Management Facility

Parameter	Maximum Monthly Mean Concentration
Radium-226 (Becquerels per liter)	0.37
Arsenic (milligrams per liter)	0.50
pH	Between 6.0 and 9.0

3. Phase 1 Reporting Requirements for Uranium Discharge

The licensee shall notify the Commission, or a person authorized by the Commission in writing, within 10 days of the measurement of a uranium concentration greater than 200 micrograms per litre in the effluent discharge at the Welcome Waste Management Facility.

APPENDIX C

References and Effluent Limits Associated with Phases 2 and 3 of the Port Hope Long-Term Low-Level Radioactive Waste Management Project

1. Phase 2: On-Site Project Activities (construction of the Port Hope Long-Term Waste Management Facility; limited to on-site activities only).
 - Environmental Assessment Follow-up Program
 - Water Treatment Definition
 - Detailed Design Description Report: Long-term Low Radioactive Waste Management Facility
 - Detailed Design Description Report: Welcome Waste Management Facility – Excavation Plan
 - Port Hope Project QA Plan
 - Port Hope Project Radiation Protection Plan
 - Port Hope Project Environmental Management and Protection Plan for Construction Activities
 - Port Hope Project Site Security Plan
 - Port Hope Project Radioactive Material Transportation Plan
 - Port Hope Project Training Plan
 - Port Hope Project Occupational Health & Safety Plan
 - Port Hope Emergency Plan
2. Phase 2: Off-Site Project Activities (continued construction of the Port Hope Long-Term Waste Management Facility and off-site remedial cleanup activities).
 - Detailed Design Description Report: Remediation Sites
 - Port Hope Project Environmental Management and Protection Plan for Off-site Activities
3. Phase 3 Long-Term Operations.
 - Long-Term Monitoring and Maintenance Plan

APPENDIX C (cont'd)

**References and Effluent Limits Associated with Phases 2 and 3 of the
 Port Hope Long-Term Low-Level Radioactive Waste Management Project**

4. Effluent Limits³ for the Port Hope Long-Term Waste Management Facility

Contaminant	Units	Criterion
²²⁶ Ra	Bq/L	0.37 (1.1)
Arsenic	ppm	0.5 (1.0)
Copper	ppm	0.3 (0.6)
Lead	ppm	0.2 (0.4)
Nickel	ppm	0.5 (1.0)
Zinc	ppm	0.5 (1.0)
Total Suspended Solids	ppm	25
Uranium	ppm	2.5 (5)
Acenaphthalene	ppb	10
Fluoranthene	ppb	13.2
Naphthalene	ppb	10
Benzo(a)anthracene	ppb	10
Benzo(a)pyrene	ppb	10
Benzo(k)fluoranthene	ppb	10
Chrysene	ppb	10
Acenaphthene	ppb	10
Anthracene	ppb	10
Phenanthrene	ppb	10
Pyrene	ppb	12.5
Oil and Grease/TPH	ppm	20
Note: Monthly mean with maximum acceptable concentrations in a single grab shown in parentheses		

³ pH: Between 6.0 and 9.0

APPENDIX D

Table D.1: Clean-up Criteria for Inorganic COPC⁴ in Surface Soils for Phase 2 of the Port Hope Long-Term Low-Level Radioactive Waste Management Project

	Residential Properties and Port Hope Sites Without Development Constraints ²	LLRW Facilities ³ and Port Hope Sites with Development Constraints	LLRW Deposits at Centre Pier Site	Industrial Sites (where no LLRW present) ⁴
Primary COPC				
²²⁶ Ra (Bq/g) ^{1,5}	0.24	0.92	0.24	-
²³⁰ Th (Bq/g) ^{1,5}	1.11	4.62	1.11	-
²³² Th (Bq/g) ^{1,5}	0.103	0.343	0.103	-
Arsenic (ppm)	20 ⁶	40 ⁶	20 ⁶	40 ⁶
Antimony (ppm)	13 ⁶	40	13 ⁶	40 (13) ⁶
Cobalt (ppm)	40	80	40	80
Copper (ppm)	225 (150)	225	225	225
Nickel (ppm)	150	150	150	150
Uranium (ppm)	35	76	35	76
Lead (ppm)	200 ⁶	1,000	200 ⁶	1,000 (200) ⁸
Fluoride ⁷ (ppm)	N/A	2,000	N/A	N/A
Secondary COPC				
Barium (ppm)	750	1,500	750	1,500 (750) ⁸
Beryllium (ppm)	-	-	-	1.2
Boron (ppm)	1.5	2.0	1.5	2.0
Cadmium (ppm)	12 (3)	12	12	-
Mercury (ppm)	10	10	10	10
Molybdenum (ppm)	40 (5)	40	40	40 (20) ⁸
Selenium (ppm)	10 (2)	10	10	10
Silver (ppm)	20	40	20	40
Vanadium (ppm)	200	200	200	200
Zinc (ppm)	600	600	600	600
Notes:				
¹ Criteria are expressed as incremental concentrations for radionuclides; total concentrations for other COPC.				
² Lower values (in parentheses) represent MOE "Table 2" values for agricultural land use in potable groundwater situations. Other values are applicable to residential land uses (where two values are listed) or to both residential and agricultural land uses (where only one value is given).				
³ Concentrations higher than criteria listed may be acceptable at depths >1.5 m.				
⁴ Categorization of Primary and Secondary COPC at industrial sites differ from those for LLRW sites.				
⁵ Summation rules apply to ²²⁶ Ra, ²³⁰ Th and ²³² Th. Criteria for these COPC represent incremental concentrations.				
⁶ Alternate site-specific values may be appropriate for As, Sb and Pb in surficial soils depending on site-specific conditions.				
⁷ Fluoride criterion based on CCME criterion for industrial land use, applicable at Port Granby only.				
⁸ Lower values applicable at former Coal Gasification Plant site if cleanup is to meet residential land use. (Lower values are indicated only for the COPC present at Coal Gasification Plant).				

⁴ Constituents of Potential Concern

APPENDIX D (con't)

Table D.2: Clean-up Criteria for Organic COPC in Surface Soil at Industrial Sites for Phase 2 of the Port Hope Long-Term Low-Level Radioactive Waste Management Project

COPC	Criterion
Petroleum hydrocarbons (C6 – C10)	230 (30)
Petroleum hydrocarbons (>C10 – C16)	150 (150)
Petroleum hydrocarbons (>C16 – C34)	1,700 (400)
Petroleum hydrocarbons (>C34)	3,300 (2,800)
Benzene (ppm)	5.3
Chlorobenzene (ppm)	8
1,3-Dichlorobenzene (ppm)	30
1,4-Dichlorobenzene (ppm)	30
1,2,4-Trichlorobenzene (ppm)	30
3,3-Dichlorobenzidine (ppm)	1.3
PCBs (ppm)	25
Naphthalene (ppm)	40 (40)
Acenaphthalene (ppm)	840 (100)
Acenaphthene (ppm)	1,300 (1,000)
Fluorene (ppm)	350 (350)
Phenanthrene (ppm)	40 (40)
Anthracene (ppm)	28 (28)
Fluoranthene (ppm)	40 (40)
Pyrene (ppm)	250 (250)
Benzo(a)anthracene (ppm)	40 (40)
Chrysene (ppm)	19 (12)
Benzo(b)fluoranthene (ppm)	19 (12)
Benzo(k)fluoranthene (ppm)	19 (12)
Benzo(a)pyrene (ppm)	1.9 (1.2)
Indeno(1,2,3,c,d)pyrene (ppm)	1.9 (1.2)
Dibenzo(a,h)anthracene (ppm)	1.9 (1.2)
Benzo(g,h,i)perylene (ppm)	40 (40)
Notes:	
Criteria in bold apply to parameters that are primary COPC at one or more of the industrial waste-contaminated sites.	
Values in parentheses apply to the Coal Gasification Plant property if residential land use is desired after cleanup.	

APPENDIX D (con't)

Table D.3: Water Quality Criteria⁵ for Discharge to the Environment for Phase 2 of the Port Hope Long-Term Low-Level Radioactive Waste Management Project

Contaminant	Units	Criterion
²²⁶ Ra	Bq/L	0.37 (1.1)
Arsenic	ppm	0.5 (1.0)
Copper	ppm	0.3 (0.6)
Lead	ppm	0.2 (0.4)
Nickel	ppm	0.5 (1.0)
Zinc	ppm	0.5 (1.0)
Total Suspended Solids	ppm	25
Uranium	ppm	2.5 (5)
Acenaphthalene	ppb	10
Fluoranthene	ppb	13.2
Naphthalene	ppb	10
Benzo(a)anthracene	ppb	10
Benzo(a)pyrene	ppb	10
Benzo(k)fluoranthene	ppb	10
Chrysene	ppb	10
Acenaphthene	ppb	10
Anthracene	ppb	10
Phenanthrene	ppb	10
Pyrene	ppb	12.5
Oil and Grease/TPH	ppm	20
Note: Monthly mean with maximum acceptable concentrations in a single grab shown in parentheses		

⁵ pH: Between 6.0 and 9.0

APPENDIX D (con't)

Table D.4: Water Quality Criteria⁶ for Discharge to Municipal Sanitary Sewer System for Phase 2 of the Port Hope Long-Term Low-Level Radioactive Waste Management Project

Contaminant	Criterion (mg/L)
Total Suspended Solids	350
Arsenic	1
Antimony	5
Cadmium	0.7
Chromium	5
Cobalt	5
Copper	3
Mercury	0.05
Molybdenum	5
Nickel	3
Selenium	5
Silver	5
Zinc	3
Fluoride	10
1,4-Dichlorobenzene	0.47
Total PAHs	0.005
Oil and Grease	15

⁶ pH: Between 6.0 and 9.0

APPENDIX D (con't)

Table D.5: Water Quality Criteria for Potable Groundwater Conditions for Phase 2 of the Port Hope Long-Term Low-Level Radioactive Waste Management Project

Contaminant	Criterion
Primary COPCs (mg/L)	
Antimony	0.006
Arsenic	0.025
Lead	0.01
Uranium	0.02
Secondary COPC (mg/L)	
Barium	1
Boron	5
Cadmium	0.005
Copper	1
Fluoride	1.5
Mercury	0.001
Selenium	0.01
Radioactive Constituents* (Bq/L)	
²³⁸ U	2.8
²³⁴ U	2.8
²³⁰ Th	0.65
²²⁶ Ra	0.49
²¹⁰ Pb	0.2
²¹⁰ Po	0.11
²³² Th	0.60
²²⁸ Ra	0.20
²²⁸ Th	1.9
²²⁴ Ra	2.1

*MOE criteria updated to incorporate ICRP-72 dose coefficients. For groundwater containing more than one radionuclide, the following limit shall apply:

$$c_1/C_1 + c_2/C_2 + c_i/C_i \leq 1$$

where c_i is the activity concentration of radionuclide i and C_i is the criterion for radionuclide i .