CMD 21-H104.1

File/dossier: 6.01.07 Date : 2020-10-27 e-Docs pdf: 6565407

## Written submission from Saskatchewan Research Council

## Mémoire du Saskatchewan Research Council

In the Matter of

À l'égard de

#### Application for a licence to abandon the **SLOWPOKE-2** reactor facility

Demande d'un permis d'abandon à l'égard de l'installation du réacteur SLOWPOKE-2

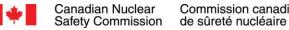
Public Hearing - Hearing in writing based on written submissions

Audience Publique - Audience fondée sur des mémoires

**July 2021** 

**July 2021** 



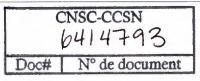


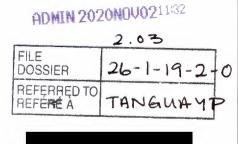


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October 27, 2020

Mr. Pierre Tanguay Senior Project Officer, Nuclear Processing Facilities Division Canadian Nuclear Safety Commission 280 Slater Street PO Box 1046, Station B Ottawa, Ontario KIP 5S9

## **Re: Application for the Licence to Abandon the Saskatchewan Research Council SLOWPOKE-2 Facility** (SRCSF).

The Saskatchewan Research Council SLOWPOKE-2 Facility (SRCSF) has a Non-Power Reactor Operating Licence, NPROL-19.01/2023 which is valid until June 30, 2023. The Canadian Nuclear Safety Commission (CNSC) held a hearing September 26, 2019 to consider an application from the Saskatchewan Research Council (SRC) to amend its Non-Power Reactor Operating Licence for its SLOWPOKE-2 non-power reactor and associated facilities. Following the deliberations and decision of the Commission on this matter, the Commission issued a licence amendment to allow for the decommissioning of the SRCSF.

The Decommissioning of SRCSF is now complete. This letter requests that a licence to Abandon the SRCSF be issued and that the NPROL-19.01/2023 in place at that time be revoked on the date the Licence to Abandon the SRCSF becomes effective. The proposed start date for the Licence to Abandon is March 1, 2021. This Application for a Licence to Abandon the SRCSF includes the following attachments:

a) Attachment 1, which shows how each of the requirements of the Nuclear Safety and Control Act and Regulations are addressed in the Application and in the licensing support documents referenced in the Application; and

b) Attachment 2, which, together with the licensing support documents referenced in it, provides the detailed information to address the requirements identified in Attachment 1.

The Decommissioning - End State Report will be submitted to the CNSC by November 6, 2020. If you have any comments or questions with regard to our requests or to the attached documents please do not hesitate to contact us.

Yours sincerely,

Mike Crabtree, President & CEO

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Attachments:

1. Application for the Licence to Abandon SRCSF - Attachment 1.

2. Application for the Licence to Abandon SRCSF-Attachment 2.

## <u>Saskatchewan Research Council</u> <u>Application for the Licence to Abandon SRCSF – Attachment 1</u>

CNSC Document and associated Requirements	Section of the Application (Attachment 2) addressing the requirement	SRCSF Decommissioning Project Support Document (Note: If edition, date or revision number is not specifically mentioned below, the documents applicable to the SRCSF decommissioning project will at the latest revision issued as "approved for use".)
General Nuclear Safety and Control Regulations		
3. (1) An application for a licence shall contain the following information:		
(a) the applicant's name and business address;	A.1	- N/A
(b) the activity to be licensed and its purpose;	С	- N/A
(c) the name, maximum quantity and form of any nuclear substance to be encompassed by the licence;	B.3	- No nuclear substances beyond exemption levels will be present within the boundaries of the SRCSF as will be confirmed by the results of the final radiological survey presented in Section 7 of the End State Report, 147-01600- ESDR-002.
(d) a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence;	B.2	- No nuclear facility, prescribed equipment or prescribed information will be present within the boundaries of SRCSF as will be confirmed by the Section 2 of End State Report, 147-01600-ESDR-002 which will provide the facility description including the identification of the materials, equipment and premises released/cleared from regulatory control

CNSC Document and associated Requirements	Section of the Application (Attachment 2) addressing the requirement	SRCSF Decommissioning Project Support Document (Note: If edition, date or revision number is not specifically mentioned below, the documents applicable to the SRCSF decommissioning project will at the latest revision issued as "approved for use".)
(e) the proposed measures to ensure compliance with the <i>Radiation</i> <i>Protection Regulations</i> , the <i>Nuclear</i> <i>Security Regulations and the</i> <i>Packaging and Transport of Nuclear</i> <i>Substances Regulations, 2015;</i>	E.1 F	- No measures to ensure compliance with Radiation Protection Regulations or Nuclear Security Regulations are required for the purpose of the Licence to Abandon the SRCSF. The radiological condition of the facility will be presented in Section 7 of the End State Report, 147-01600-ESDR-002.
(f) any proposed action level for the purpose of section 6 of the <i>Radiation Protection</i> <i>Regulations;</i>	E.1	- None
(g) the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information;	F	- None
<ul> <li>(h) the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information;</li> </ul>	F	- None
<ul> <li>(i) a description and the results of any test, analysis or calculation performed to substantiate the information included in the application;</li> </ul>	G	<ul> <li>Environmental Impact Statement- Saskatchewan Research Council SLOWPOKE-2 Reactor Decommissioning, Version 3.0, Matrix Solutions document, April 2019.</li> <li>End-State Decommissioning Report, Candu Energy Document 147-01600-ESDR-002</li> </ul>

CNSC Document and associated Requirements	Section of the Application (Attachment 2) addressing the requirement	SRCSF Decommissioning Project Support Document (Note: If edition, date or revision number is not specifically mentioned below, the documents applicable to the SRCSF decommissioning project will at the latest revision issued as "approved for use".)
(j) the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licenced, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licenced, and the proposed method for managing and disposing of that waste;	B.4	- All nuclear and hazardous waste has been disposed of, and no waste is stored within the boundaries of SRCSF at this time or at the time of Abandonment. This will be presented in the Section 9 of the End State Report, 147-01600-ESDR- 002.
<ul> <li>(k) the applicant's organizational management structure insofar as it may bear on the applicant's compliance with the Act and the regulations made under the Act, including the internal allocation of functions, responsibilities and authority;</li> </ul>	A.2	- None
(1) a description of any proposed financial guarantee relating to the activity to be licenced	Н	- None

CNSC Document and associated Requirements	Section of the Application (Attachment 2) addressing the requirement	SRCSF Decommissioning Project Support Document (Note: If edition, date or revision number is not specifically mentioned below, the documents applicable to the SRCSF decommissioning project will at the latest revision issued as "approved for use".)
(m)any other information required by the Act or the regulations made under the Act for the activity to be licenced and the nuclear substance, nuclear facility, prescribed equipment or prescribed information to be encompassed by the licence; and	None	- None
<ul> <li>(n) – Repealed by SOR/2008-119, s.2</li> <li>(1.1) The Commission or a designated officer authorized under paragraph 37(2)(c) of the act may require any other information that is necessary to enable the Commission or the designated officer to determine whether the applicant</li> <li>(i) is qualified to carry on the activity to be licenced, or</li> <li>(ii) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national</li> </ul>	N/A	- N/A



CNSC Document and associated Requirements	Section of the Application (Attachment 2) addressing the requirement	SRCSF Decommissioning Project Support Document (Note: If edition, date or revision number is not specifically mentioned below, the documents applicable to the SRCSF decommissioning project will at the latest revision issued as "approved for use".)
security and measures required to implement international obligations to which Canada has agreed.		
<ul> <li>(2) Subsection (1) does not apply in respect of an application for a licence to import or export for which the information requirements are prescribed by the <u>Nuclear Non-Proliferation Import</u> and Export Control Regulations, or in respect of an application for a licence to transport while in transit for which the information requirements are prescribed by the <u>Packaging and Transport of</u> <u>Nuclear Substances Regulations</u>, 2015.</li> <li>SOR/2008-119, s. 2; SOR/2015-145, s. 43.</li> </ul>		

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CNSC Document and associated Requirements	Section of the Application (Attachment 2) addressing the requirement	SRCSF Decommissioning Project Support Document (Note: If edition, date or revision number is not specifically mentioned below, the documents applicable to the SRCSF decommissioning project will at the latest revision issued as "approved for use".)
Application for Licence to Abandon		
<b>4</b> An application for a licence to abandon a nuclear substance, a nuclear facility, prescribed equipment or prescribed information shall contain the following information in addition to the information required by section 3:		
(a) the name and location of the land, buildings, structures, components and equipment that are to be abandoned;	B.1	<ul> <li>End-State Decommissioning Report, Candu Energy Document 147-01600-ESDR-002, Section 2.</li> </ul>
(b) the proposed time and location of the abandonment;	B.5	- N/A
(c) the proposed method of and procedure for abandonment; and	С	- N/A.
(d) the effects on the environment and the health and safety of persons that may result from the abandonment, and the measures that will be taken to prevent or mitigate those effects.	E.2	<ul> <li>End-State Decommissioning Report, Candu Energy Document 147-01600-ESDR-002, Section 7.</li> </ul>

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CNSC Document and associated Requirements	Section of the Application (Attachment 2) addressing the requirement	SRCSF Decommissioning Project Support Document (Note: If edition, date or revision number is not specifica mentioned below, the documents applicable to the SRC decommissioning project will at the latest revision issued "approved for use".)		
<b>Class 1 Nuclear Facility Regulations</b>				
8 An application for a licence to abandon a Class I nuclear facility shall contain the following information in addition to the information required by sections 3 and 4 of the <u>General Nuclear Safety and</u> <u>Control Regulations</u> :				
(a) the results of the decommissioning; and	D	- End-State Decommissioning Report, Candu Energy Document 147-01600-ESDR-002, Sections 3, 5, 7, 9 and 10.		
(b) the results of the environmental monitoring programs.	E.3	The radiological condition of the facility will be presented in the Section 7 of the End-State Decommissioning Report, Candu Energy Document 147-01600-ESDR-002. No environmental monitoring activities are necessary for the purposes of Licence to Abandon SRCSF.		

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### SASKATCHEWAN RESEARCH COUNCIL Application for The Licence to Abandon the Saskatchewan Research Council Slowpoke-2 Facility (SRCSF) – Attachment 2

**OCTOBER 2020** 

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## A. DATA ABOUT THE APPLICANT

#### A.1 Applicant's Name and Business Address

Applicant's Full Name: The Saskatchewan Research Council

#### Head Office Address:

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125-15 Innovation Boulevard Saskatoon, Saskatchewan S7N 2X8

#### **Business Address:**

125-15 Innovation Boulevard Saskatoon, Saskatchewan S7N 2X8

## Saskatchewan Research Council (SRC) SLOWPOKE-2 Physical Location:

SRC Environmental Analytical Laboratories

#### Address:

102 - 422 Downey Road, Saskatoon, Saskatchewan S7N 4N1

#### SRC Facility Manager's Address: Philip Rees

CSO & Facilities Manager Saskatchewan Research Council 125 - 15 Innovation Boulevard Saskatoon, SK, Canada S7N 2X8 Voice: +1.306.385.4024 Philip.Rees@src.sk.ca

#### A.2 Applicant's Organizational Structure

The end state objective of decommissioning activities is to achieve conditions that will allow the return of areas occupied by the **Saskatchewan Research Council SLOWPOKE-2 Facility** (SRCSF) to unrestricted use, as will be presented in Section 3 of the End State Report (Reference [1]).

At the completion of the decommissioning activities the reactor core and the radioactive hazardous waste have been removed from the SRCSF and no prescribed equipment, prescribed information or nuclear substances beyond clearance levels (Reference [1]) are present within the boundaries of the SRCSF. SRC plans to terminate the long-term lease agreement and return the building possession to SPM (Saskatchewan Property Management) after the completion of the decommissioning work and issuance of the Licence to Abandon by the CNSC, allowing unrestricted use of the space occupied by the facility. There was no change in the foot print of the building during the decommissioning work. The SRC President and CEO, has the responsibility for the oversight of administration of the space occupied by SRCSF.

### B. DATA ABOUT THE FACILITY, NUCLEAR SUBSTANCES, NUCLEAR AND HAZARDOUS WASTE, PRESCRIBED EQUIPMENT, AND PRESCRIBED INFORMATION TO BE ABANDONED

#### B.1 Location of Land, Buildings and Structures

The SRCSF is located in the Innovation Place Research Park in Saskatoon and the building that houses the facility was one of the first buildings constructed in the Research Park in 1980. The Research Park is home to a number of applied research facilities engaged in the development of industrial and agricultural products and processes.

The South Saskatchewan River runs on the west side 0.7km. The Yellow Head Highway (Hwy 16) runs approximately 0.7km on the east and 1.0km on the north side. College Drive (local Hwy 5) runs 1.1km on the south side. There is no residential area within this envelope. The closest residential area is 0.8km on the east side beyond the Hwy 16. The map of the local area is presented in Figure B-1.

The SRC SLOWPOKE-2 reactor resides in the SRC Environmental Analytical Laboratories which is located on 422 Downey Road in the Innovation Place Research Park in Saskatoon, SK. The land at the Innovation Place Research Park is owned by the University of Saskatchewan, it has been leased on long term basis to SOCO (Saskatchewan Opportunities Corporation) and SPM in order to establish a Research Park. The building that houses SRCSF (422 Downey Road) is owned, operated and maintained by SPM and SRC is under a long term leased agreement. The layout of SRC buildings is shown in Figure B-2. The floor plan of the Analytical Laboratories in presented in Figure B-3 which also shows the space occupied by the SRCSF.

#### B.2 Description of Facility, Components and Equipment

The SRCSF consists of 4 rooms as shown in Figure B-4. The description, room numbers and sizes are:

- 1. Room143, uranium analysis laboratory (5.85m x 5.85m)
- 2. Room 144, gamma spectroscopy laboratory (5.85m x 5.85m)
- 3. Room 145, radioactive storage room (2.25m x 5.85m)
- 4. Room 146, reactor room (9.6m x 5.85m)

The only entrance to the SRCSF is through the double doors leading from the Radiochemistry Laboratory (Room 139) see Figure B-3, into the Room 143. The entrance to the reactor room (Room 146), in only through the Room 143. All walls of the Room 146 (reactor room) are a minimum of 20 cm masonry construction. The floor is an on-grade concrete slab with no crawl space below. The roof over the Room 146 (reactor room) is a heavy gauge steel. The radioactive samples were stored in the Room 145 and the gamma spectroscopy was performed in the Room 144. The total floor area of SRCSF is 137.5m<sup>2</sup> and the Room 146 (reactor room) occupies 55.7m<sup>2</sup>. The ceiling height of Room 146 (reactor room) is 3.4m. There is an additional space between the ceiling tiles and the hard ceiling is an additional 0.6m for a total of 4.0m. The concrete floors are covered with linoleum tiles throughout the facility.

The SRC Analytical building that houses the SRCSF was occupied by 70 staff. The space has been vacated with the relocation of the Environmental Analytical Laboratory. There was one building technician on site in this space during the regular work days. Rooms 140, 141, 142.1 and 142.2 (Figure B-3) have also been vacated.

In an adjoining, but completely separate section of SRC Analytical building, the Potash Corporation of Saskatchewan has a pilot plant operation. It is located on the (west of Rooms 122, 123 and 124, see Figure B-3). North of SRC Analytical (Figure B-2), there is a parking lot and the Innovation Place Atrium building that houses offices and research laboratories for several tenants of the Research Park including some SRC facilities. Immediately south of the building is a roadway (Downey Road). There is a parking lot across the roadway and a building that houses offices and laboratories for tenants of the Research Park.

A detailed description of the SRCSF at the completion of decommissioning activities will be provided in Section 2 of Reference [1].

#### B.3 Nuclear Substances, Prescribed Equipment and Prescribed Information

No prescribed equipment, prescribed information or nuclear substances beyond clearance levels will be present in the SRCSF at the time of abandonment.

The reactor core and other radioactive and hazardous waste have been removed and sent to other licensed facilities.

The SRCSF will be confirmed to be free of contamination, below the allowable IAEA clearance levels as will be presented in Section 4 of the End State Report (Reference [1]).

A systematic final status survey was performed in the reactor pool, in the exhaust ventilation system, and in the facility rooms affected by decommissioning work to verify that no residual contamination, beyond the clearance levels, is present following the decommissioning activities. The surveys were performed to verify that decommissioning activities have not resulted in radioactive contamination being spread to other areas of the facility, and to ensure that those areas which had originally contained radiological materials were within the accepted release limits. The absence of any contamination within the facility confirmed that the measures taken to decontaminate and survey all items leaving the facility were fully effective in eliminating the spread of radioactive contamination. The results of both surveys will be included in Section 7 of the End State Report (Reference [1]). The results will demonstrate that all the structures, equipment and components remaining within the boundaries of the SRCSF meet the clearance level criteria and that the SRCSF is in a state to be released for unrestricted use.

#### B.4 Nuclear and Hazardous Waste

The name, quantity, form, origin and the volume of the waste resulting from the decommissioning process, including the final destinations will be presented in Section 9 of the End State Report (Reference [1]).

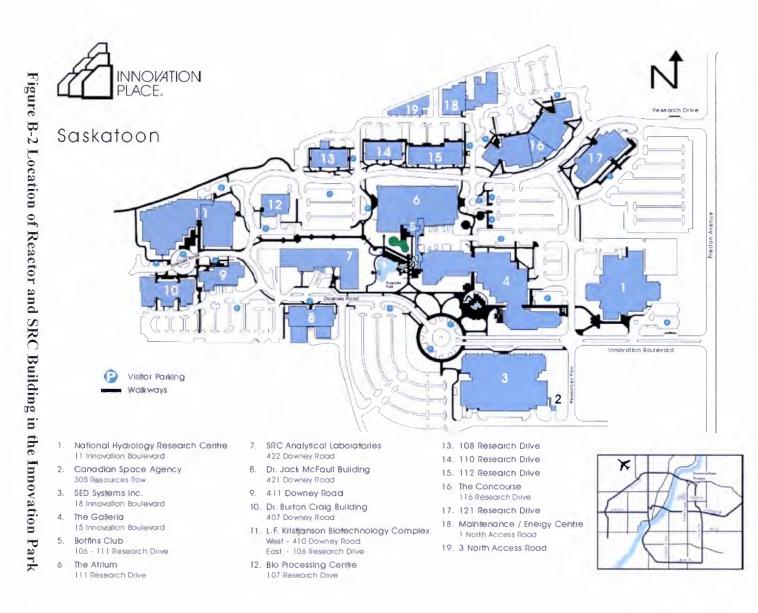
All waste has been disposed of, and no waste will be stored within the boundaries of the SRCSF at the time of abandonment. Therefore no waste management process is required for the scope of this Licence.

#### B.5 Proposed Time and Location of Abandonment

The proposed time for the abandonment of the SRCSF and the release of the rooms Room143, Room 144, Room 145, Room 146 in building that houses SRCSF (422 Downey Road) in the SRC Environmental Analytical Laboratories for use of the landlord SPM is March, 2021, subject to CNSC's issuance of the Licence to Abandon.



Figure B-1 Aerial View of the SRC Environmental Analytical Laboratories



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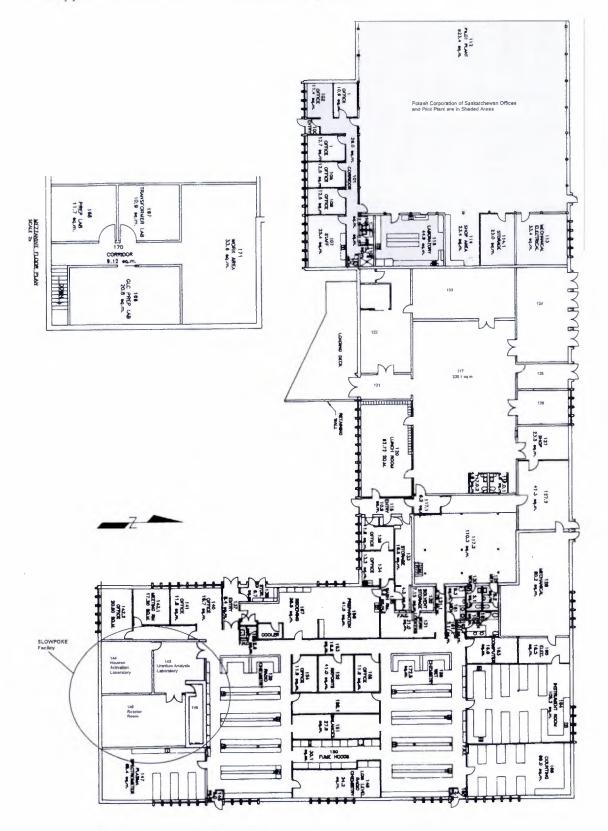


Figure B-3 SRC Analytical Floor Plan

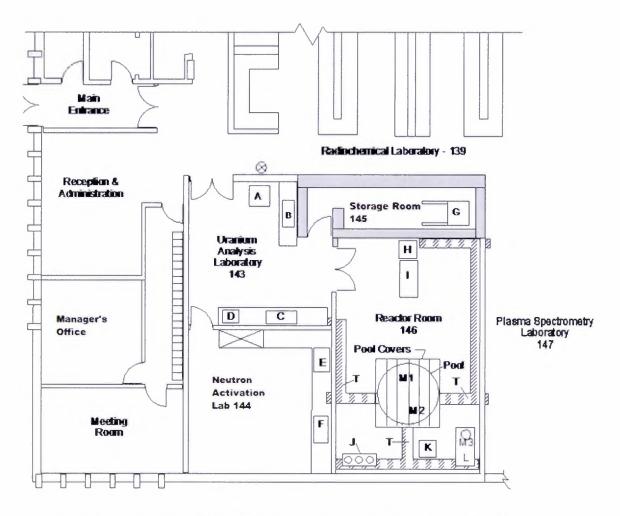


Figure B-4 Layout of SRCSF Reactor Room and Associated Labs

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## C. ACTIVITIES TO BE LICENCED

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This application is for the Licence to Abandon the SRCSF as described in Section 0. At this time the reactor core and the radioactive and the hazardous waste have been removed from the SRCSF and the reactor rooms and the reactor pool has been cleaned and surveyed to ensure that no radioactive products are present above the clearance levels, as will be documented in Section 7 of the End State Report. No licensed activities will be conducted under the license to Abandon the SRCSF.

The proposed effective date for the Licence to Abandon the SRCSF is March 1, 2021.

### D. DECOMMISSIONING RESULTS

The results of the decommissioning activities will be presented in the End State Report (Reference [1]), which will be structured as follows:

- Section 1 will provide an introduction/overview of the report;
- Section 2 will provide the facility description including the identification of the materials, equipment and premises released/cleared from regulatory control
- Section 3 will provide the description of the objectives of the decommissioning and the extent to which this objective will have been reached at the completion of the decommissioning activities;
- Section 4 will provide the radiological criteria used as the basis for the release of equipment, buildings or structures or areas from regulatory control;
- Section 5 will provide brief descriptions of the major decommissioning activities;
- Section 6 will identify the institutional controls to remain in place at the facility, if applicable;
- Section 7 will provide a summary of the final radiological condition of any remaining equipment, structures, or areas, with reference to the final radiological survey report;
- Section 8 will provide the list of structures, areas, and equipment designated for restricted use, if any, including any requirements for further monitoring, if applicable;
- Section 9 will provide descriptions of waste quantities and disposition methods;
- Section 10 will provide a summary of the radiological doses received by workers during the decommissioning activities, including a comparison of the actual doses received with the initial estimates;
- Section 11 will provide a summary of any abnormal events or incidents occurred during the decommissioning process, as applicable; and
- Section 12 will provide a discussion of the lessons learned during the decommissioning process.

# E. RADIATION PROTECTION AND RESULTS OF ENVIRONMENTAL MONITORING PROGRAMS

#### E.1 Radiation Protection Plan and Action Levels

At this time and at the time of abandonment the reactor core and the radioactive hazardous waste have been removed from the SRCSF and have been sent to other licensed facilities. The reactor rooms and the reactor pool have been cleaned and surveyed as will be documented in the Section 7 of the End State Report (Reference [1]). The radiological doses received by the workers during execution of the decommissioning activities will be reported in the Section 10 of the End State Report.

No other measures to ensure compliance with the *Radiation Protection Regulations* or the *Nuclear Security Regulations* are needed and no action levels, as defined in Section 6 of the *Radiation Protection Regulations*, are required for the purpose of the Licence to Abandon the SRCSF.

#### E.2 Effects on Environment

An Environment Impact statement (EIS) was produced for the SRCSF Decommissioning (Reference [2]). The following conclusions were made in the Environmental Impact Statement:

- This is a low risk project, as this project drew on experiences gained from other similar projects like University of Alberta and Dalhousie University.
- SRCSF decommissioning, uses the same methodology (as used in University of Alberta and Dalhousie University) for the same type of SLOWPOKE facility.
- This project uses experienced personnel with prior experience decommissioning a similar type of reactor.
- Potential of releases of contaminants to the environment low and no residual adverse effects are expected.
- The decommissioning process has very little impact on surrounding natural and social environment.
- There is no need to modify the surrounding building during decommissioning and no need to change the surrounding natural environment
- Reactor components can be easily removed from the building and directly shipped for disposal.
- The only substantive impact on the environment would be from accidental release of radioactive material during transportation. The risk and impact of such an accident will be reduced by using the appropriate packaging and adhering to applicable transport and security regulations.

Note: As on date of writing this application, the radioactive material have been transported to their final destination safely, without incidents and adhering to the applicable transport and security regulations.

• Adequate provision is being made for protection of workers, the public, and for the protection of the environment. The potential risk to workers, the public, and the environment is assessed taking into consideration normal operating conditions, malfunctions, and the potential for accidents.

Furthermore, as part of CNSC review and Commissions hearing on September 29, 2019 regarding decommissioning of SRCSF the following conclusions were made:

- SRC's environmental protection programs and compliance verification activities (e.g., inspections) continue to meet CNSC regulatory requirements.
- CNSC reviewed the Detailed Decommissioning Plan (DDP) and EIS prepared for the decommissioning of the SRC's SLOWPOKE-2 reactor project and found them to be satisfactory to meet CNSC requirements.
- SRC has and will continue to make adequate provision for the protection of the environment and the health of persons.
- The Commission examined SRC's environmental protection programs at the SRCSF, it concluded that the "The Commission is satisfied that the SRCSF environmental protection programs continue to meet the specifications of REGDOC-2.9.1".

At the completion of the SRCSF decommissioning, the contaminated equipment and other nuclear and non-nuclear components have been removed from the SRCSF. The End State (Reference [1]) of SRCSF will be documented. No nuclear substances beyond the clearance levels as defined in the IAEA safety guide, *Application of the Concepts of Exclusion, Exemption and Clearance*, RS-G-1.7 and the unconditional clearance levels as specified in the Schedule 2 of the CNSC's *Nuclear Substances and Radiation Devices Regulations* are present within the boundaries of SRCSF.

No effects on the environment and on the health and safety of persons are anticipated in regard to the abandonment of the SRCSF. Therefore, no measures need to be taken after the abandonment of the SRCSF.

#### E.3 Results of the Environmental Monitoring Program

Measurements of indoor air quality and water quality were conducted during the decommissioning. The water released from the SRCSF met the release criteria accepted by the CNSC and the City of Saskatoon, as will be documented in the End Sate Report. The results of the monitoring activities will be provided in Section 7 of the End State Report. No environmental monitoring is required for the purpose of the Licence to Abandon SRCSF.

## F. PHYSICAL PROTECTION/SECURITY

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For the purposes of the decommissioning activities a site security plan was submitted to the CNSC. After the completion of decommissioning activities, the reactor core and the radioactive and the hazardous waste have been removed from SRCSF. No prescribed equipment, prescribed information or nuclear substances beyond clearance levels are present within the boundaries of SRCSF.

No specific measures to control the access to the site or to prevent the loss or illegal use, possession or removal of nuclear substances, prescribed equipment or prescribed information will be required for the abandonment of SRCSF.

## G. ANALYSIS REPORTS/TECHNICAL REPORTS

The technical documents that provide the evaluations and the results of the decommissioning activities and the supporting information regarding the abandonment and the return to unrestricted use of SRCSF:

- Environmental Impact Statement- Saskatchewan Research Council SLOWPOKE-2 Reactor Decommissioning, Version 3.0, Matrix Solutions document, April 2019.
- End-State Decommissioning Report, Candu Energy Document 147-01600-ESDR-002 (to be issued)

The results and conclusions of these technical documents are presented in various sections of this application. References to the relevant sections of these technical reports are made to identify the source of information provided throughout this application.

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## H. FINANCIAL GUARANTEE

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No expenses are anticipated with regard to the abandonment of SRCSF and no financial guarantee is required for the Licence to Abandon the SRCSF.

## I. REFERENCES

- [1] End-State Decommissioning Report, Candu Energy Document #147-01600-ESDR-002 (to be issued).
- [2] Environmental Impact Statement- Saskatchewan Research Council SLOWPOKE-2 Reactor Decommissioning, Version 3.0, Matrix Solutions document, April 2019.

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	Document Number	Revision
	147-01600-ESDR-002	0
Nuclear Project Number	Contract Number	Page
655352	255905	1
Customer Document Number	Customer Name SASKATCHEWAN RESEAF (SRC)	RCH COUNCIL
Title:		

END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 FACILITY

Project: CANDU Services

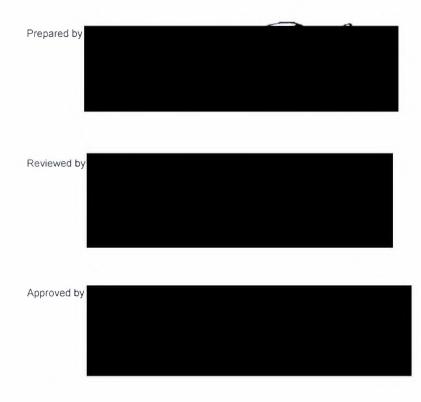
655352	255905		APPROVED FOR USE	2020/10/28
FINANCIAL PROJECT NO	CONTRACT	CHANGE ORDER	DESCRIPTION	RELEASE



	Document Number	Revision
	147-01600-ESDR-002	
Nuclear Project Number	Contract Number	Page
655352	255905	2
Customer Document Number	Customer Name SASKATCHEWAN RESEAF (SRC)	RCH COUNCIL

END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 FACILITY

Project: CANDU Services





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		Doc#:	147-01600-ES	DR-002	Rev:	0
Nuclear Project#:	655352	Contract#:	255095	Page:	3 of	201
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## **Revision History**

Ref. Procedure NU-907020-PRO-001

NU-907020-EM-001 Rev. 3

		nation, refer to the Document Transmittal Sheet accom	panying this document.		
Revis	ion History				
	Revision	Details of Rev.	Prepared By	Reviewed By	Approved By
No	Date (yyyy/mm/dd)				
D1	2020/10/13	Issued for Internal "Review and Comment"		l	ł
D2	2020/10/19	Issued for External "Review and Comment"			
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#### **TERMS AND ABBREVIATIONS**

BV Labs Candu CNL CNSC CSA DDP DI DWP ESDR HEPA HEU HVAC IAEA iCAM ISO LLD LRC NAA NEW NPROL NORM PPE OAP	Bureau Veritas Laboratories Candu Energy Inc. Canadian Nuclear Laboratories Canadian Nuclear Safety Commission Canadian Standards Association Detailed Decommissioning Plan Decommissioning Instructions Decommissioning Work Package End State Decommissioning Report High Efficiency Particulate Air High Enriched Uranium Heating Ventilation and Air Conditioning International Atomic Energy Agency Integrated Continuous Air Monitor The International Organization for Standardization Lessons Learned Document Lower Reactor Container Neutron Activation Analysis Nuclear Energy Worker Non-Power Reactor Operating Licence Naturally Occurring Radioactive Material Personal Protective Equipment Ouality Assurance Plan
QAP	Quality Assurance Plan
RAM RMC	Radioactive Material Royal Military College
SLOWPOKE	Safe Low Power Kritical Experiment
SPM	Saskatchewan Property Management

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#### 1. INTRODUCTION

This document is the End State Decommissioning Report (ESDR) for the decommissioning of the Saskatchewan Research Council SLOWPOKE-2 Facility (SRCSF) located in Saskatcoon, Saskatchewan.

This ESDR is provided as committed in the Quality Assurance Plan (QAP) [1] and Detailed Decommissioning Plan (DDP) [2], which were issued in support of the application for the amendment of the Operating Licence to allow the decommissioning of the SRCSF.

The Canadian Nuclear Safety Commission (CNSC) decommissioning planning document, CNSC Regulatory Guide G-219 Decommissioning Planning for Licensed Activities [3] provides guidelines for the content and structure of ESDRs that are to be submitted to the CNSC for acceptance following the completion of physical decommissioning activities. ESDR is structured to meet the requirements outlined in the CNSC guidelines and meet the requirements of the Canadian Standards Association (CSA) Standards CSA N286-12 [4] and CSA N294-09 [5]. The structure and content of the report are consistent with Annex D of CSA N294-09 [5].

Decommissioning activities have been completed in the SRCSF. Security and other requirements continue to be in place, as required per Security Plan [6].

The ESDR is a supporting document to the Saskatchewan Research Council's application in order to revoke the current Operating Licence and to obtain the License to Abandon the space that is occupied by SRCSF allowing for unrestricted access.

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## 2. FACILITY DESCRIPTION

#### 2.1 Name and Address of the Facility

The name and address of the facility is:

Saskatchewan Research Council SLOWPOKE-2 Facility 422 Downey Road Saskatchewan Research Council, Saskatoon, SK S7N 4L8

The holder of Licence is:

M. Crabtree Saskatchewan Research Council 125-15 Innovation Boulevard, Saskatoon, SK S7N 2X8

#### 2.2 Site Description, Location and Boundaries of the Facility

The SRCSF is located in the Innovation Place Research Park in Saskatoon and the building that houses the facility was one of the first buildings constructed in the Research Park in 1980. The Research Park is home to a number of applied research facilities engaged in the development of industrial and agricultural products and processes.

The South Saskatchewan River runs 0.7 km on the west side. The Yellow Head Highway (Hwy 16) runs approximately 0.7 km on the east and 1.0 km on the north side. College Drive (local Hwy 5) runs 1.1 km on the south side. There is no residential area within this envelope. The closest residential area is 0.8 km on the east side beyond the Hwy 16. The map of the local area is presented in Figure 1.

The SRC SLOWPOKE-2 reactor resides in the SRC Environmental Analytical Laboratories which is located on 422 Downey Road in the Innovation Place Research Park in Saskatoon, SK. The land at the Innovation Place Research Park is owned by the University of Saskatchewan, it has been leased on long term basis to SOCO (Saskatchewan Opportunities Corporation) and SPM (Saskatchewan Property Management) in order to establish a Research Park. The building that houses SRCSF (422 Downey Road) is owned, operated and maintained by SPM and SRC is under a long term leased agreement. The layout of SRC buildings is shown in Figure 2. The floor plan of the Analytical Laboratories in presented in Figure 3, which also shows the space occupied by the SRCSF.

The SRC plans to terminate the long term lease agreement and return the building possession to SPM after the completion of the decommissioning work and issuance of the Licence to Abandon by the CNSC, allowing unrestricted use of the space occupied by the facility. There were no changes made to the foot print of the building during the decommissioning work.

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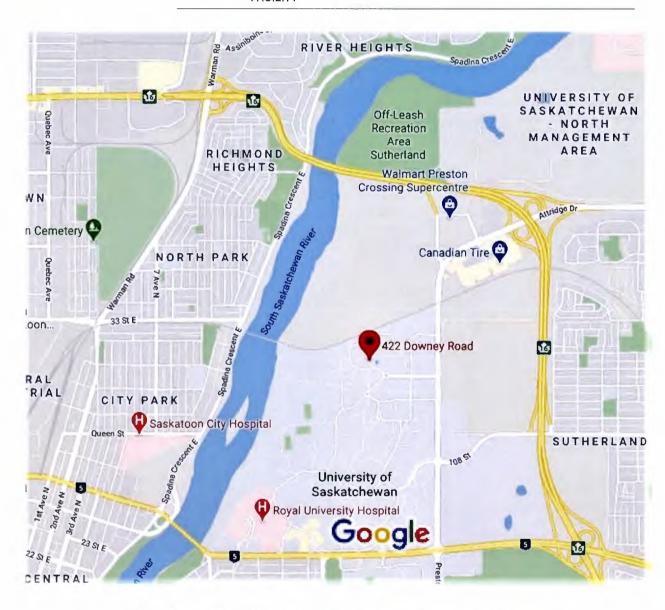


Figure 1 Map of SRC & University of Saskatchewan Located in Saskatoon Source: http://www.maps.google.com

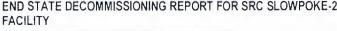
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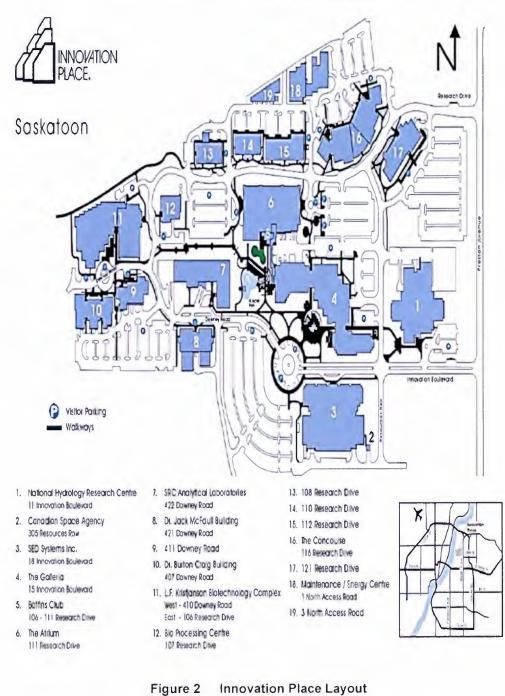
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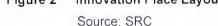
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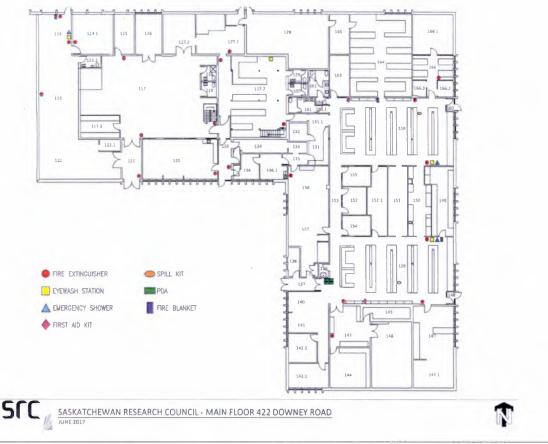
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The SRCSF consists of 4 rooms as shown in Figure 4. The description, room numbers and sizes are:

- 1. Room 143, uranium analysis laboratory (5.85m x 5.85m)
- 2. Room 144, gamma spectroscopy laboratory (5.85m x 5.85m)
- 3. Room 145, radioactive storage room (2.25m x 5.85m)
- 4. Room 146, reactor room (9.6m x 5.85m)

The only entrance to the SRCSF is through the double doors leading from the Radiochemistry Laboratory (Room 139) see Figure 3, into the Room 143. The entrance to the reactor room (Room 146), in only through the Room 143. All walls of the Room 146 (reactor room) are a minimum of 20 cm masonry construction. The floor is an on-grade concrete slab with no crawl space below. The roof over the Room 146 (reactor room) is a heavy gauge steel. The radioactive samples were stored in the Room 145 and the gamma spectroscopy used to be performed in the Room 144.

The total floor area of SRCSF is 137.5m<sup>2</sup> and the Room 146 (reactor room) occupies 55.7m<sup>2</sup>. The ceiling height of Room 146 (reactor room) is 3.4m. There is an additional space between the ceiling tiles and the hard ceiling is an additional 0.6m for a total of 4.0m. The concrete floors are covered with linoleum tiles throughout the facility.

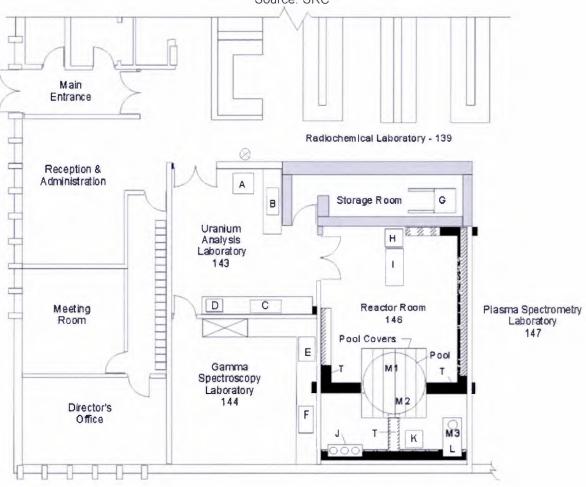


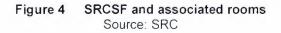
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The SRC Analytical building that houses the SRCSF was occupied by a staff of 70. The space has been vacated with the relocation of the Environmental Analytical Laboratory. There was one building technician on site in this space during the regular work days. Rooms 140, 141, 142.1 and 142.2 (Figure 3) have also been vacated.

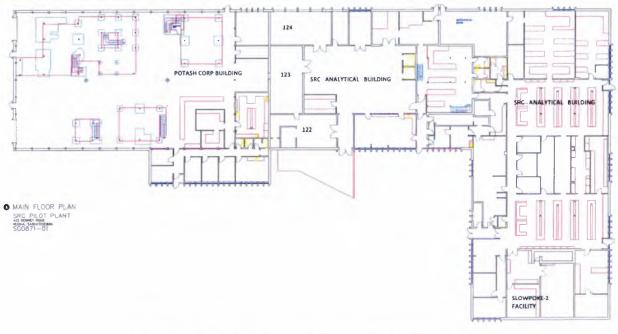
In an adjoining, but completely separate section of SRC Analytical building, the Potash Corporation of Saskatchewan has a pilot plant in operation. It is located on the west of Rooms 122, 123 and 124 (see Figure 5). North of SRC Analytical (Figure 2), there is a parking lot and the Innovation Place Atrium building that houses offices and research laboratories for several tenants of the Research Park including some SRC facilities. Immediately south of the building is a roadway (Downey Road). There is a parking

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lot across the roadway and a building that houses offices and laboratories for tenants of the Research Park.



#### Figure 5 Floor Plan -- Potash Corp and SRC Analytical Source: SRC

### 2.3 Type of Facility

The SRCSF was a pool type reactor featuring a highly enriched uranium core surrounded by beryllium reflectors, and cooled by light water via natural convection. Biological shielding was provided by the water filled pool, and moveable concrete shielding blocks which covered the pool. The SRCSF major and auxiliary components were located in Rooms 146, 144, and 143. The radioactive samples were stored in the Room 145.

The SRCSF was established in order to operate purely for scientific purposes. The reactor was used as an analytical tool to analyze for uranium and organic halides. It was used primarily as a neutron source for NAA (Neutron Activation Analysis) and in support of research programs of the Saskatchewan University and other institutions, agencies, and industrial groups in Western Canada. The facility was also helping provide uranium analysis by using the delayed neutron counting technique. More recently, the reactor had been used as a teaching tool in cooperation with the University of Saskatchewan. First criticality of the reactor was achieved on March, 1981 and the reactor was formally transferred to the SRC on March, 1981. The SRC was registered by an operating licence from the CNSC NPROL-19.00/2023 valid through June 2023 [7].

The SRCSF operated under a Non-Power Reactor Operating Licence NPROL – 19.00/2023 [7], until an amendment to the licence was issued. The Record of Decision for this amendment is presented in Appendix A. The SRCSF is currently in the decommissioning process, according to the Non-Power Reactor Licence Amendment (NPROL – 19.01/2023 valid until June 2023), which was issued to Saskatchewan Research Council pursuant to the Nuclear Safety and Control Act, on December 6, 2019.

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The Amended Non-Power Reactor Operating Licence includes both: operation and decommissioning activities, which allows the SRC to decommission the SRCSF and meet the regulatory requirements for decommissioning. The amended licence is presented in Appendix B. Over the period that the SRCSF was in service, it was successfully operating with no significant interruptions.

The reactor was licensed to operate at a maximum nominal thermal neutron flux of 1E+12 n/cm<sup>2</sup>/s. The primary use of the reactor had been as a neutron source to perform neutron activation analysis (NAA) and to produce radionuclides. At the time of commissioning the reactor the licence allowed a maximum excess reactivity of 3.4mk.

During the initial years of reactor operation, numerous uranium analyses were performed. The demand for the uranium analyses gradually declined; however, the decline had been offset by increased demand for neutron activation analyses. On average, the reactor operates three days a week, five hours a day. As per April 2018, the reactor had been operated for 97,930E+11 flux-hours. Reactor usage prior to the decommissioning was relatively constant over the previous decade at around 3,000E+11 flux-hours per year.

The additional neutron flux seen by the components and fuel during the period leading up to the decommissioning, following the cessation of operation for the purpose of irradiating samples, was predicted to result in a negligible increase in activity relative to the values indicated [8].

## 2.4 Buildings and Areas Affected by Decommissioning

A radiological baseline survey was performed throughout all the four rooms (143, 144, 145, and 146,) of the facility. The SRCSF layout is presented in Figure 4. This included random direct checks and smears (biased to most probable contaminated locations) to establish an understanding of the contamination levels. No contamination above absolute release criteria and no unexpected radiation fields were found in the baseline survey. The baseline survey data for the facility is presented in Appendix C.

Room 143 was a Uranium Analysis Laboratory. It was equipped with uranium analysis system which was removed from SRCSF before decommissioning work began. The irradiation controllers and a sample irradiation receiver were dismantled. This equipment was checked for contamination and disposed for recycle/reuse. The end state radiological survey was performed to ensure there is no removable or fixed contamination in excess of the established release criteria. No contamination was found in this room exceeding release criteria. The end state radiological survey data of the facility is presented in Appendix D.

Room 144 was equipped with gamma spectroscopy equipment which was removed from the facility before decommissioning work began. The irradiation controllers and irradiation receivers located in room 144 were dismantled. This equipment was checked for contamination and disposed for recycle/reuse within SRC. An initial radiological baseline survey was performed in the Room 144 to ensure there was no removable or fixed contamination in excess of the established release criteria. No contamination was found in this room exceeding release criteria. The end state radiological survey data of the facility is presented in Appendix D.

**Room 145** was used as a storage room for radioactive samples. All radioactive material was removed from this room. There was no hazardous material left in the Room 145. Previously used ion exchange columns of the reactor purification system and the previously used beryllium shims were removed from this room, packaged into Type A container and shipped to CNL as a radioactive waste. The radioactive waste data sheets and associated gamma spec reports regarding all radioactive waste shipped to CNL is

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presented in the Appendix E. The end state final radiological survey was performed in this room to ensure there was no removable or fixed contamination in excess of established release criteria.

**Room 146** was a Reactor Room. The reactor was located inside a pool built into the floor of this room. The only access to the reactor room is through entrance from Room 143. Radiological baseline surveys were performed in this room and the data is presented in Appendix C.

All radioactive and hazardous material was removed. It includes, irradiated fuel, reactor components, auxiliary components, activated concrete, and lead acid batteries.

The end state final systematic survey was performed and the data is presented in Appendix D.

#### 2.5 Materials, Equipment and Premises Released from Regulatory Control

The premises expected to be released from regulatory control, as a result of the decommissioning work, is the space occupied by SRCSF as identified in Figure 3 above, consisting of the rooms and the remaining amenities described in the previous section. As shown in Section 7 of this report, the remaining premises, materials and equipment meet the clearance criteria for unrestricted use stipulated in the Radiation Protection Requirements applicable to the SRCSF Decommissioning Project [9], for surface contamination or in the CNSC "Nuclear Substances and Radiation Devices Regulations", SOR/2000-207 [10] for activity concentrations.

The highly enriched uranium (HEU) fuel was removed from the reactor in the presence of IAEA, CNSC, and US DOE representatives. The HEU fuel was transferred into its dedicated transfer flask (F-257) which was later shipped to the licenced facility (Savannah River Site in US) for final storage. The Bill of Lading and the confirmation of the irradiated fuel received by US DOE are presented in Appendix F.

During the execution of the decommissioning work, all radioactive material which left the SRCSF (excluding the HEU fuel) was packaged into Type A containers and transported to the licensed facility of CNL in Chalk River, Ontario for long term storage.

Numerous samples were collected during decommissioning in order to determine the radionuclide inventory and chemical/biological contaminants prior to their disposal. The list of samples is presented below:

- The reactor water and pool water mixture was run through the reactor water deionizer (ion exchange column) for several days to remove the radionuclides. A sample from the mixed water was obtained and analysed for radionuclides and chemical/biological contaminants. The water sample was analyzed by the SRC for radionuclides and also by an external laboratory BV Labs (Bureau Veritas Laboratories) for other chemical/biological contaminants. The data is presented in Appendix G. The mixed pool water met the release criteria. The reports were sent to the City of Saskatoon and the CNSC. The City of Saskatoon accepted the report and allowed the water to be discharged into the sanitary sewer. The approval from the City of Saskatoon and recommendation from CNSC is presented in Appendix G.
- Gamma spectrometer analysis was performed on several samples of the reactor components. The gamma spec reports of the samples are presented in Appendix E. These reports were sent to CNL for acceptance as radioactive waste.
- Several samples of concrete from the reactor pool floor and wall was drawn in order to assess the extent of activation. All samples were analysed by gamma spectrometry. All concrete and rebar, that did not meet the unconditional release criteria, was removed and packaged. A detailed technical letter was written in support of this activity [11]. This letter will be re-submitted as a

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separate document with the Application for the Licence to Abandon. Appendix H presents the sampling plan for concrete in the reactor pool. The details can also be found in the CNSC compliance inspection report [12].

- Part of the removed concrete was packaged and shipped to CNL to be stored as radioactive waste. Remaining part of the concrete is packaged in 6 industrial drums and is currently located in the SRC site. CNL has been contacted to accept this waste. It is planned that this waste will be shipped to CNL in the coming weeks. The site data sheets and gamma spectroscopy reports of this concrete have been provided to CNL for their internal process. A copy of email from SRC to CNSC which includes these reports is presented in Appendix I. A separate letter will be submitted to the CNSC after the concrete has been shipped to CNL waste storage facility.
- All equipment and material that met the unconditional release criteria was released from the SRC site after necessary radiological surveys for fixed and non-fixed contamination. The release forms for all the equipment and material that was released is presented in Appendix J. The majority of the equipment was shipped to local recycling and waste disposal facilities in the Saskatoon area. The other auxiliary reactor components were released to various facilities/organizations as per the Detailed Decommissioning Plan [2].

## 3. DECOMMISSIONING OBJECTIVES

## 3.1 Objectives

The end state objective for the decommissioning of the SRCSF is to have the Operating Licence revoked allowing the SRC unrestricted use of the building and services remaining in the space previously occupied by the facility.

At the completion of SRCSF decommissioning process, all contaminated and other equipment associated with the nuclear operation of SRCSF have been removed. The SRCSF has been confirmed as being below approved radioactive contamination criteria, below the allowable IAEA clearance limits as defined in RS-G-1.7 [13], IAEA Safety Standard Series; Application of the Concepts of Exclusion, Exemption and Clearance, August 2004, or below clearance criteria accepted by the CNSC. The unconditional clearance level limits are defined in Schedule 2 of SOR/2000-207 [10].

The ventilation system and other service systems (water, air, electrical) remain in service, and the structures associated with them are confirmed to be below the established unconditional release limits. The ventilation system was surveyed for radiological contamination and no contamination was found above unconditional release limits.

The reactor pool remains in place, and will be filled with grout after the necessary approval from the CNSC is obtained. It was confirmed that the structural materials and inner surface coating satisfy the applicable IAEA clearance limits and that radionuclides concentrations are below the unconditional limits.

The biological shielding blocks, other equipment and systems have been removed from the SRCSF, and have been sent to the appropriate waste management facilities. The unconditional release documentation is presented in Appendix J.

A radiation physics assessment report [8] was written in support of the SRCSF decommissioning. The [8] describes the acceptance criteria in further detail.

The irradiated fuel was sent to the US DOE Savannah River Site (SRS). All other radioactive equipment and radioactive waste was shipped to licensed facilities at CNL as a RAM shipment. The associated documentation is presented in Appendix E.

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The results of the radiological surveys and assessments presented in Section 7 of this report confirm that the premises, equipment, and materials located in the space previously occupied by SRCSF meet the clearance criteria for unrestricted use stipulated in the Radiation Protection Requirements applicable to SRCSF [9] for surface contamination, or in the CNSC "Nuclear Substances and Radiation Devices Regulations" SOR/2000-207 [10] for activity concentrations.

All equipment and waste that met the unconditional release criteria was sent to appropriate waste management facilities in the local area or the destinations where they could be reused/recycled.

## 3.1.1 Objectives of Room 146 (Reactor Room)

The end state objective of this room is for it to be free of all radioactive and hazardous material.

The end state objectives of Room 146 as presented in DDP [2] were:

- Remove irradiated fuel and ship to SRS (Savanah River Site) in F-257 flask.
- Remove all reactor components from the reactor pool and ship to CNL as radioactive waste in Type A containers, this includes upper reactor container, LRC, all irradiated beryllium components, irradiation tubes, thermocouple, flux detector, control rod, and all fasteners etc.
- Remove reactor water purification system will be shipped to CNL as radioactive waste in Type A container.
- o Remove pool water purification system and reuse.
- o Remove reactor control console and reuse or recycle.
- Remove sump pump to dispose as non-radioactive waste.
- o Remove all irradiation controllers and receivers for reuse or recycle.
- Remove all fixed or loose radioactive contamination in excess of regulatory limits.
- Process the reactor pool water (mixed water) through ion exchange columns and dispose the water in the sewer after achieving the free release criteria.
- Remove irradiated part of the reactor pool floor which will include the concrete and the rebar and dispose as radioactive waste.
- Ensure there is no hazardous material left in the room e.g. radioactive samples resulting from irradiation in the reactor, waste materials (gloves, irradiated vials and swipes).
- Fill the reactor pool and the trenches with concrete after necessary inspection and clearance from the CNSC.

The end state objectives for this room were completed and are presented below:

- o Irradiated fuel was removed and shipped to SRS site in F-257 flask.
- All reactor components from the reactor pool were removed and shipped to CNL as radioactive waste in Type A containers; this includes upper reactor container, lower reactor container, all irradiated beryllium components, all irradiation tubes, thermocouple, flux detector, control rod, and plastic tubing.
- Reactor water purification system and previously used ion exchange columns were removed and shipped to CNL as radioactive waste in Type A containers.
- Pool water purification system was removed, it was unconditional released, and shipped to Ecole Polytechnique SLOWPOKE-2 facility.

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- o Reactor control console was removed, unconditional released and shipped to IAEA.
- Sump pump was not removed from the room as there's still a need to remove the water in case of flooding.
- o Irradiation controllers were removed and recycled/reused.
- All surfaces were surveyed for fixed and non-fixed contamination. There is no fixed or non-fixed contamination in excess of the regulatory limits present in this room. The end state radiological survey data is presented in Appendix D.
- The reactor pool water (mixed water) was processed through ion exchange column and disposed the water into the sewer after achieving the approvals from the City of Saskatoon, see Appendix G.
- All the irradiated parts of the reactor pool floor and wall was removed. There is no irradiated concrete left in the reactor pool which is above UCL [11]. The reactor pool Areas 48 and 48.5 (as shown in Appendix D) showed elevated counts. This area was treated for further removal of the paint, due to which the count rates were elevated. After removal of the paint, the count rate reduced significantly. The maximum residual fixed/non-fixed activity was 0.24 Bq/cm<sup>2</sup>. The details are provided in Reference [12] (Page 30).
- Cadmium capsules were packaged and transported to Environmental and Analytical Laboratory (Atrium Building) for reuse/recycle.
- o There is no radioactive or hazardous material left in the room.
- The reactor pool and the trenches have NOT been filled with concrete/grout as yet. The necessary clearance from the CNSC is awaited. SRC will execute this activity and inform/update CNSC after the completion of this end state objective.

### 3.1.2 Objectives of Room 145

The Room 145 (Radioactive Storage Room) contained radioactive materials. It was used as a storage room for the previously used ion exchange columns of the reactor purification system and the previously used beryllium shims.

The end state objectives of Room 145 as presented in DDP [2] were:

- Remove previously used ion exchange columns and ship to CNL as radioactive waste in Type A container.
- Remove all radioactive beryllium shims and ship to CNL as radioactive waste in Type A container. These will be packaged with the remaining beryllium components removed from the reactor.
- The non-irradiated beryllium shims will be shipped to RMC of Canada for use at their SLOWPOKE-2 facility or returned back to CNL for safe storage.
- o Ensure there is no loose or fixed contamination in excess of the regulatory limits.
- Ensure there is no hazardous material left in the room e.g. radioactive samples resulting from irradiation in the reactor, waste materials (gloves, irradiated vials and swipes).

The end state objectives for this room were completed and are presented below:

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- Previously used ion exchange columns were removed and shipped to CNL as radioactive waste in Type A container.
- All irradiated beryllium shims were removed and shipped to CNL as radioactive waste in Type A container. These were packaged with the remaining beryllium components removed from the reactor.
- The un-irradiated beryllium shims (that were never used in the reactor) were shipped to RMC for use at their SLOWPOKE-2 facility.
- All surfaces were surveyed for fixed and non-fixed contamination. There is no fixed or non-fixed contamination in excess of the regulatory limits present in this room. The end state radiological survey data is presented in Appendix D.
- There is no radioactive or hazardous material left in the room.

#### 3.1.3 Objectives of Room 144

The Room 144 (Gamma Spectrometry Lab) contained gamma spectroscopy equipment and irradiation controller/receiver.

The end state objectives of Room 144 as presented in DDP [2] were:

- o Remove gamma spectroscopy equipment from the room and relocate in SRC for recycle/reuse.
- o Perform radiation survey of the removed components.
- o Remove all irradiation controllers and receivers for reuse or recycle.
- Dispose the plastic tubing as radioactive waste that connects the auxiliary components to the reactor.
- Ensure there is no loose or fixed contamination in excess of the regulatory limits.
- Ensure there is no hazardous material left in the room e.g. radioactive samples resulting from irradiation in the reactor, waste materials (gloves, irradiated vials and swipes).

The end state objectives for this room were completed and are presented below:

- The gamma spectroscopy equipment was removed from the Room 144 before the decommissioning work began. This equipment is being used by the SRC at a different location.
- o Radiation survey of the removed equipment was performed.
- One (1) irradiation controller and one (1) receiver were shipped to IAEA. The remaining irradiation controllers and receivers were shipped to the RMC of Canada SLOWPOKE-2 facility for recycle/reuse.
- The plastic tubing which connected the auxiliary components to the reactor was packaged into Type A containers and shipped to CNL as radioactive waste.
- All surfaces were surveyed for fixed and non-fixed contamination. There is no fixed or non-fixed contamination in excess of the regulatory limits present in this room. The end state radiological survey data is presented in Appendix D.
- There is no radioactive or hazardous material left in the room.

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### 3.1.4 Objectives of Room 143

The Room 143 served as the entrance to the facility and also used as uranium analysis laboratory. It contained the same equipment. The room contained irradiation controllers and a sample irradiation receiver.

The end state objectives of Room 143 as presented in DDP [2] were:

- Perform radiation survey of the removed components.
- The uranium analysis system will be removed from the SRCSF after the planned shutdown of the reactor in April 2019 but before the decommissioning work begins. This system will be reused or recycled.
- Remove all irradiation controllers and receivers for reuse or recycle.
- Dispose the plastic tubing as radioactive waste that connects the auxiliary components to the reactor.
- o Ensure there is no loose or fixed contamination in excess of the regulatory limits.
- Ensure there is no hazardous material left in the room e.g. radioactive samples resulting from irradiation in the reactor, waste materials (gloves, irradiated vials and swipes).

The end state objectives for this room were met and completed and are presented below:

- Radiation survey of the all the removed equipment was performed.
- The uranium analysis system was removed from the SRCSF after the planned shutdown of the reactor in April 2019 and transferred to the RMC (Royal Military College) of Canada SLOWPOKE-2 facility for reuse.
- All irradiation controllers and receivers were shipped for future use to the RMC of Canada SLOWPOKE-2 facility.
- The plastic tubing which connected the auxiliary components to the reactor was packaged into Type A containers and shipped to CNL as radioactive waste.
- All surfaces were surveyed for fixed and non-fixed contamination. There is no fixed or non-fixed contamination in excess of the regulatory limits present in this room. The end state radiological survey data is presented in Appendix D.
- o There is no radioactive or hazardous material left in the room.

### 3.2 Decommissioning Strategy

The decommissioning strategy chosen by SRC was a prompt removal of fuel and all radioactive materials; in order to get the operating licence revoked permitting an unrestricted use of the facility.

The decommissioning work started after the NPROL amendment had been issued by the CNSC. The Record of Decision for this amendment is presented in Appendix A. The SRCSF is currently in the decommissioning process, according to the Non-Power Reactor Licence Amendment (NPROL – 19.01/2023 valid until June 2023), which was issued to SRC pursuant to the Nuclear Safety and Control Act, on December 6, 2019.

The decommissioning work included removal of reactor components followed by packaging and transportation to licensed radioactive waste facility in CNL. The decommissioning work also included obtaining concrete core samples from the reactor pool for activation assessment followed by removal of

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all activated concrete which was above the unconditional release criteria. End state radiation surveys were performed to ensure no fixed or non-fixed contamination is present above the clearance levels.

CNSC performed a compliance inspection from July 8 to 10, 2020, which included the areas of environmental protection, waste management, and radiation protection. The CNSC compliance inspection report (SRC-2020-01) was issued on September 22, 2020 [12]. The report concluded the following:

- o There are no solids present above unconditional clearance levels in the SRC facility.
- o There is no liquid present above unconditional clearance levels in the SRC facility.
- The iCAM was in use on continuous basis (24 hours a day) throughout the decommissioning
  process in order to monitor the quality of air in the reactor room. There was no incident to report
  for any airborne contamination in the reactor room except due to radon progeny.
- A non-compliance was noted by the CNSC [12], that the gamma characterization of the remaining concrete in the drums was not provided at the time of writing of this inspection report. However, the non-compliance has now been addressed by performing the gamma characterization of the concrete in the drums. A copy of the email from SRC to CNSC and the characterization report is presented in Appendix I. This provides the confirmation that the non-compliance has been addressed.

Further details can be found in the inspection report [12].

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## 4. RELEASE CRITERIA

## 4.1 Non-Radiological Contaminants

The Hazard Analysis that was carried out in preparation for the decommissioning work in the SRCSF recognized that beryllium and cadmium presented potential non-radiological hazards for the workers. As a result, the decommissioning work instructions included appropriate precautions and requirements for protective equipment and clothing to minimize the risk to the workers. These precautions were adhered throughout the decommissioning process which resulted in an incident free work.

## 4.2 Radiological Contaminants

The radiological contaminants expected during the decommissioning activities were in liquid, solid, and airborne forms. Estimates of the radiological contaminants were documented in References [9] and [11], which served as bases for irradiated waste management and collective dose assessment in addition to evaluating the radiological hazards.

Information about the types of contaminants encountered during decommissioning and the criteria used for the release of radiological contaminants from the SRCSF is provided in the following sections.

## 4.2.1 Liquids

The liquid discharge was the water from the reactor pool (approximately 28,000 litres), which was discharged into the City of Saskatoon sanitary sewer system after it had been treated to reduce the activity to be below the release limits accepted by the CNSC and the City of Saskatoon. Appendix G provides the acceptance criteria which were used to support the decision to release the water. Appendix G also provides the detailed results of the analysis of water samples. The analysis results confirm that the release criteria were satisfied and the water was released into the City of Saskatoon sewer system.

## 4.2.2 Solids

The disposal of radioactive reactor components was performed as described in the Detailed Decommissioning Plan (See Section 10 of [2]). All items were monitored for radioactive contamination before released from SRCSF. The HEU fuel was transferred into its dedicated transfer flask (F-257) which was later shipped to the licenced facility (Savannah River Site in the US) for final storage.

Radioactive and contaminated components for which no re-use has been identified were packaged in Type A containers and sent for storage at a licensed facility in CNL.

Radioactive wastes were characterized as they were packaged. Characterization included monitoring for fixed and removable contamination with bulk radiochemical analysis for significant radionuclides. The analyses (Bq/kg) were combined with the masses of the materials to generate an estimate of the radionuclide inventories in each shipping container. A listing of the inventory of each container was maintained and it was accompanied to the shipment when the wastes were transported from the SRCSF.

A radioactive waste management plan [14] was written as a separate document to full fill the requirements as stipulated in CSA N294-09 [5].

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## 4.2.2.1 Solids Removed

The results of the radiation measurements and the final destination of the reactor components and other waste that was removed are presented in Appendix E, which provides the waste management records for all radioactive solid waste shipped from SRC. The F-257 Flask containing the irradiated fuel was transported to the US DOE, SRS. The bill of lading and the receipt confirmation is presented in Appendix F.

The radioactive concrete waste which was generated during the activated concrete removal process are described in Section 2.5 of this document. Appendix H presents the sampling plan for concrete cores in the reactor pool. The removed concrete was shipped from SRC in the Type A container as a radioactive waste to CNL. The remaining concrete is packaged into 6 steel drums and is planned to be shipped to CNL in the next few weeks. A technical letter will be provided to CNSC to confirm that the shipment has taken place.

### 4.2.2.2 Solids Retained

Measurement results of the remaining reactor pool shows that there is no concrete remaining in the reactor pool which is above unconditional release limit, see [12] for details.

### 4.2.3 Airborne Contaminants

The Alpha/Beta Integrated Continuous Air Monitoring (iCAM) was used throughout the project (24 hours a day) to monitor for any potential radioactive airborne contaminants in room 146. No measurable non-NORM in-air radioactivity was detected during decommissioning process.

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## 5. DECOMMISSIONING ACTIVITIES

### 5.1 Major Decommissioning Activities

The decommissioning of the SRCSF was completed using seven Decommissioning Work Plan/Packages (DWPs).

For each DWP, documentation was prepared to include, as applicable: Radiological Work Plan [15], Decommissioning Instructions (DIs), Decontamination Procedures, Hazard Assessment, Waste Management Data Sheets, Work Permits, StepBack (Pre-Job), Post-job Reviews, and Confined Space Clearances.

The summary of work packages is presented in the following sub-sections.

### 5.1.1 Defueling Preparations – DWP #1

The work competed under DWP #1, Defueling Preparations:

- Radiological baseline surveys were performed of Rooms 143, 144, 145, and 146 (reactor room), similar to operational surveys performed previously, to confirm radiological status of the facility. The results of the baseline surveys are presented in Appendix C.
- Removal of equipment from Rooms 143, 144, 145, and 146 (reactor room) which were not required for the subsequent operation of the reactor and the decommissioning process, and which were not previously removed as permitted under the Operating Licence. Such items were surveyed to ensure that they met criteria for release.
- Established of a 1m x 1m grid on the walls and floor for systematic square meter baseline radiological survey of Room 146. All transferrable contamination found was removed, and the area resurveyed to confirm release criteria were met, no fixed or non-fixed contamination was left.
- Radiation survey of the concrete blocks (biological shielding) was performed to confirm they met established unconditional release criteria and were subsequently removed from the facility and disposed for landfill.
- Installation of the safety railing around the reactor pool was completed in order to comply the safety guidelines.
- o Safety checks were performed to ensure radiation monitoring devices were working properly.
- Safety check were performed to ensure reactor auxiliary systems were working properly.
- o Safety check were performed to ensure irradiation systems were working properly.
- Removal of pool water cooling coil and attachments were performed.
- Collected pool water and reactor water samples to establish baseline for radionuclides and chemical contaminants.
- Operated the reactor at low power to verify proper operation of all necessary control equipment and instrumentation.
- Verified existing excess reactivity of the fuel by performing a period measurement.
- o Determined the reactivity worth of cadmium capsules.

#### 5.1.2 Core Removal – DWP #2

The work completed under DWP #2, Core Removal:

Removal of the following components, in order to make the reactor sub-critical:

- o Small irradiation tubes.
- o Large irradiation tube.

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o Beryllium shims.

- o Shim tray.
- o Outlet core water thermocouple and guide tube.
- Neutron flux detector and guide tube.
- o Control rod.

Other activities that were completed in order to remove the fuel and prepare for shipment:

- o Removed the upper reactor container tie rods.
- Transferred the F-257 Flask to the reactor pool floor.
- Relocated the upper reactor container to the side to allow unrestricted access to the fuel assembly.
- o Removed the irradiated fuel from the critical assembly.
- Performed underwater video inspection of the irradiated fuel
- o Transferred irradiated fuel into F-257 flask.
- o Placed the plug on the F-257 flask.
- Removed F-257 flask from the reactor pool.
- o Obtained water samples from the F-257 flask.
- Performed radiation survey of the F-257 flask.
- o Installed the fire shield on the F-257 flask and completed shipment preparations.
- o Transferred F-257 transport package to the designated temporary storage area in Room 146.
- o Transferred F-257 transport package from temporary storage onto the transporter.
- o Shipped F-257 transport package to Savannah River Site, US.

Staff from the IAEA, CNSC and US DOE witnessed the loading of the core into the F-257 flask, IAEA staff placed safeguards seal on the F-257 flask after it was raised from the reactor pool.

#### 5.1.3 Reactor Components Removal – DWP #3

The work completed under DWP #3, Reactor Components Removal:

- Removed the control rod motor and drive assembly.
- o Sampled pool water and performed a radiological assessment.
- Removed the critical assembly (beryllium assembly) and packed into the beryllium shielding container.
- o Removed the shim tray and transferred into the beryllium shielding container.
- Transferred all irradiated beryllium shims into the shim tray in the beryllium shielding container.

The following components were removed from the reactor pool, cut and packed for shipment:

- o Upper reactor container.
- o Irradiation tubes.
- o Outlet core water thermocouple.
- o Neutron flux detector.
- o Control rod.

Other activities that were completed under DWP-003, Reactor Components Removal:

- o Removed of the longitudinal support beams.
- o Removed the lower reactor container out from the reactor pool.
- o Cut the lower reactor container support bars and packed.
- o Transferred the lower reactor container into the shielding container.
- o Cut and packed the lower section support rods.
- Removed the reactor radiation monitor.

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- o Removed and disposed the longitudinal support beams and platform plates.
- Prepared and installed pumping system for the pool water disposal.
- o Measured pool water sample for radionuclides and chemicals.
- Disposed pool water.

#### 5.1.4 Auxiliary Components Removal – DWP #4

The work completed under DWP #4, Auxiliary Components Removal:

- o Removed the reactor water purification system and packed for shipment.
- Packed previously used purification columns.
- Packed the pool water purification system and associated tubing.
- o Removed disposed the sample irradiation system and associated tubing.
- Removed and disposed the radiation monitoring system.
- Removed and disposed the area radiation monitor.
- Removed and packed the gas purge system.
- Removed and disposed the service box.
- o Removed and disposed the reactor control console.

#### 5.1.5 Pool Cleanup – DWP #5

The work completed under DWP-005, Pool Cleanup:

- o Established confined space clearance after performing initial hazard assessment.
- Established a 1m x 1m grid on the pool wall and floor.
- Performed radiation survey to identify the fixed and non-fixed contamination locations.
- Removed non-fixed and fixed contamination.
- o Performed systematic radiation survey of pool walls and floor.
- Removed activated concrete from pool floor and wall.
- o Measured the concrete samples for radioactivity due to neutron activation.

### 5.1.6 Final Survey – DWP #6

The work completed under DWP #6, Final Survey:

- Performed systematic end state radiation survey of Room 146 to ensure decommissioning activities have not resulted in radioactive contamination.
- Performed general end state radiation survey of all the remaining areas including the other rooms in the SRCSF (Rooms 143, 144, and 145).
- o Removed of all fixed and non-fixed contamination found during the radiation survey.
- o Repeated radiation survey of the recently decontaminated locations.
- Shipped all radioactive waste to the waste management facility of CNL.

A Compliance Inspection was conducted by CNSC during July 10-12, 2020 [12].

### 5.1.7 Civil Work and Restoration – DWP #7

This work is pending completion under DWP #7, Civil Work and Restoration:

SRC has requested CNSC to perform this activity.

Interior work in Room 146:

- Filling and covering the reactor pool with grout.
- Filling the trenches with grout.
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- o General cleaning of the room.
- o Confirming that the lighting, fire alarm and internal access doors are all operational.
- Ensuring that appropriate signage is in place and locks are installed to the SRC standard for this space.

#### 5.2 Decommissioning Schedule

A schedule showing the start and completion of the major activities comprising the SRCSF decommissioning project is presented in Appendix K.

#### 5.3 Budgeted versus Actual Decommissioning Cost

The project approved budget was \$6,665,826.00 (including taxes). The project cost breakdown figures are as listed in the DDP, Section 12 [2]. The actual cost of the project is well within the available budget. The breakdown of cost is presented in Appendix N.

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#### 6. REMAINING ENTITIES AND INSTITUTIONAL CONTROLS

The scope of the SRCSF decommissioning project included to obtain the unrestricted use of the building and services remaining in the space currently occupied by the facility.

It is expected that the current operating licence will be revoked by the CNSC. This will confirm that the objective has been achieved.

After obtaining the clearance and revoking the operating licence, provisions will be made, if necessary, to allow for further inspections by IAEA/CNSC personnel reporting to the non-proliferation of nuclear weapons division.

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## 7. FINAL RADIOLOGICAL STATUS

## 7.1 Final Radiological Condition

Following the dismantling of the SLOWPOKE-2 reactor at Saskatchewan Research Council and the removal of non-radioactive and radioactive waste, a final end state survey was performed in the reactor pool, in the exhaust ventilation system, and in the facility rooms affected by decommissioning work. The surveys were performed to verify that decommissioning activities have not resulted in radioactive contamination being spread to other areas of the facility, and to ensure that those areas which had originally contained radiological materials were within the accepted release limits. The absence of any contamination within the facility confirmed that the measures taken to decontaminate and survey all items leaving the facility were fully effective in eliminating the spread of radioactive contamination.

The surveys performed in the facility consisted of gamma dose rate measurements, surface contamination, and removable contamination measurements (beta/gamma, alpha emitters). The unconditional release criteria used to assess the surface contamination measurements are obtained from Table 7 of [9]. The results of the final release survey are provided in Appendix D and confirm that all surveyed areas of the reactor facility have a level of radiation below the unconditional release criteria.

Concentrations of radionuclides in the reactor pool concrete and reinforcing steel re-bars from the walls and the pool floor were measured and compared with the unconditional release limits from [10]. Reference [11] provides the results of the testing for each of the concrete samples taken from the reactor pool. The results show that the activity concentrations in the remaining pool structure are below unconditional clearance levels.

## 7.2 Areas Remaining Above the Release Criteria

No areas of the SRCSF remain above the unconditional release criteria as shown in Appendix D and [12].

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## 8. STATE RELEASE

The decommissioning of the SRCSF as authorized by NPROL-19.01/2023 (Revision 2), Appendix B, has been completed as described in this report. The space occupied by the facility is deemed to be suitable for unrestricted use, and it is expected to be confirmed by the CNSC by revoking the current operating licence.

There are no conditions remaining in the SRCSF that are considered to require further monitoring.

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## 9. WASTE QUANTITIES AND DISPOSITION

#### 9.1 Planned versus Actual Quantities

There has been no change between the planned and the actual waste quantities except the activated concrete removed from the reactor pool. Additional amount of concrete was removed from the reactor pool in order to meet the requirements. The [11] provides the details.

### 9.2 Radioactive Waste, Cleared Materials and Other Special Wastes

Appendix E provides a listing of all radioactive waste that was shipped to the CNL Waste Management Area.

Appendix J provides a listing of all the materials that were cleared for unconditional release, and the destination of those items. As described in Section 2.5, most of the items were segregated for reuse, recycling, or waste disposal.

### 9.3 Disposition to Storage Sites

Materials and items of equipment with activity below the unconditional release limit were released from SRCSF by the Radiation Safety Officer after they were surveyed for radioactive contamination by the Candu Group 1 Radiation Surveyor. Records of the release of those materials are included in Appendix J.

These releases include hazardous and non-hazardous wastes that were transported to local waste disposal and recycling facilities.

Samples of materials (solids and liquids) which were sent for analysis by outside laboratories were assessed and determined to be below the limits for Exempt Shipments.

Materials, equipment, and wastes which were determined to have activity above the limits for unconditional release, and which were not sent as Exempt Shipments to laboratories for analysis and disposal, were transported from the facility as Radioactive Material (RAM) consignments. These shipments were assessed and released by a certified RAM Shipper.

The RAM consignments departed from Saskatoon on March 6, 2020 following the release by the CNL RAM Shipper. The details of the contents of the Type A containers and the records of the shipment are provided in Appendix E.

## 9.4 Material Buried on the Site

Surveys of the rooms and equipment remaining in the SRCSF demonstrated that activity was below the unconditional release limits. There is no radioactive material buried or left behind in the SRC site which is above unconditional release limits.

## 9.5 Airborne or Liquid Waste Emissions

There were no radiological airborne or liquid wastes emissions during the decommissioning process.

The reactor room was maintained under slight negative pressure and the air quality was measured continuously by using iCAM. A sample report is presented in Appendix L. The air monitoring equipment, iCAM, results also show that there were no non-NORM radioactive airborne materials detected during the decommissioning process.

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## 10. PERSONNEL DOSES

The individual and collective worker dose estimates for the decommissioning of the SRCSF are shown in Table 20 of [8]. The measured doses are provided in Appendix M.

The action level was defined to be 1 mSv/person. Only one crew member (Mechanical Technician 1) received whole body dose beyond 0.1 mSv for the whole duration of the decommissioning process. The total reportable dose for the whole crew was 0.16 mSv. This is an exceptionally low dose compared to the previous experiences of UASF and DUSR decommissioning. The dose report is presented in Appendix M.

No recordable dose to the extremities was received to any crew members.

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## 11. ABNORMAL OCCURRENCES AND INCIDENTS

No reportable event occurred during the execution of the decommissioning work of the SRCSF.

Since the SRCSF reactor assembly has been effectively and successfully dismantled, we include recommendations in the Lessons Learned Document, to ensure that future jobs of a similar nature benefit from this experience. Section 12 of this report provides details regarding the associated lessons learned.

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## 12. LESSONS LEARNED

A Lessons Learned Document (LLD) has been prepared for the SRCSF Decommissioning Project and is documented in [16]. Summaries of the lessons learned identified in the LLD are provided below:

- Excellent radiation protection techniques were employed which resulted in the low radiation dose to personnel.
- The daily Step-Back (pre-job) and post-job helped to plan the daily activities and identifying who was performing each task. This resulted in reducing the dose to the workers
- An additional RP resource was employed during the final stages of the project. The RP workload
  was elevated during the end state surveys. This reduced the site work duration and hence saved
  unnecessary cost.
- The staff were well trained, coordinated and competent in their work which helped the site work to finish ahead of schedule.
- The SRCSF SLOWPOKE-2 decommissioning Project Team played an active and invaluable role throughout the planning and execution stages of the decommissioning. Involvement by the Project Team contributed significantly to keeping the project focused, avoided situations which might have negatively impacted scheduling and aided in bringing the project within schedule and under budget.
- During the public hearing for the Licence to Decommission, it was noted by the public that concrete slurry which was above UCL, was buried inside the reactor pool prior to filling with grout. This end state report and the associated supporting document [11] shows that no such material above UCL is present in the SRC.

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#### 13. REFERENCES

- SNC-Lavalin, "SRC Decommissioning Quality Assurance Plan", <u>147-912020-QAP-004</u> Revision 1, 2019.
- [2] SNC-Lavalin, "SRC Detailed Decommissioning Plan", <u>147-01600-DDP-002</u> Revision 1, 2019;
- [3] Canadian Nuclear Safety Commission, "Decommissioning Planning for Licensed Activities", Regulatory Guide G-129, 2000.
- [4] Canadian Standards Association, "Management System Requirements for Nuclear Facilities", CSA N286-12 (R2017).
- [5] Canadian Standards Association, "Decommissioning of Facilities Containing Nuclear Substances", CSA N294-09, 2014.
- [6] Saskatchewan Research Council, "Site Security Plan".
- [7] Saskatchewan Research Council, "Non-Power Reactor Operating Licence SLOWPOKE-2 Reactor", NPROL-19.00/2023.
- [8] SNC-Lavalin, "Radiation Physics Assessment Report", <u>147-03320-ASD-004</u> Revision 1, 2019.
- [9] SNC-Lavalin, "Action Levels and Radiation Protection Requirements", <u>147-03400-REPT-002</u> Revision 1, 2019.
- [10] Government of Canada: SOR/2000-207, "Nuclear Substances and Radiation Devices Regulations", Canada Minister Of Justice, June 6, 2016.
- [11] SNC Lavalin, "Supporting Evidence for Unconditional Release of SRC SLOWPOKE 2 Reactor Pool Concrete", 147-CECNSC-20-0001, 2020.
- [12] CNSC: SRC-2020-01, CNSC Compliance Inspection Report
- [13] International Atomic Energy Agency, "Application of the Concepts of Exclusion, Exemption and Clearance", IAEA RS-G-1.7.
- [14] SNC-Lavalin, "Action Levels and Radiation Protection Requirements", <u>147-01622-REPT-002</u> Revision 0, 2018.
- [15] SNC-Lavalin, "Radiological Work Plan for SRC SLOWPOKE-2 Facility", <u>147-03400-RWP-002</u> Revision 0, 2018.
- [16] SNC-Lavalin, "SRCSF Decommissioning Project Lessons Learned Report", 147- 904010-LLD-005 Latest Revision.

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## Appendix A THE RECORDS OF DECISION FOR ISSUING THE NON-POWER REACTOR LICENCE AMENDMENT

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Canadian Nuclear Safety Commission Commission canadienne de sûreté nucléaire

# **Record of Decision**

DEC 19-H100

In the Matter of

#### Applicant Saskatchewan Research Council

Subject Application to Amend the Non-Power Reactor Licence for the SLOWPOKE-2 Reactor to Authorize Decommissioning

Public Hearing September 26, 2019 Date

Record of December 6, 2019

Decision Date

Canada

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- 16. The Impact Assessment Act<sup>4</sup> (IAA) came into force August 28, 2019. Under the IAA and the Physical Activities Regulations<sup>5</sup> made under it, impact assessments (IA) will be conducted on projects identified as having the greatest potential for adverse environmental effects in areas of federal jurisdiction. While CEAA 2012 and not the IAA applies to this project, the Commission notes that the decommissioning of an existing reactor is not an activity identified in the regulations for an IA under the IAA.
- 17. The Commission considered the completeness and adequacy of the environmental protection review under the NSCA and its regulations that CNSC staff conducted for this licence amendment. CNSC staff findings for the proposed SRCSF decommissioning included, but were not limited to:
  - Radiation doses to the public resulting from decommissioning activities are estimated to be 0.1 mSv, well below the regulatory dose limit for members of the public of 1.0 mSv;
  - Air will be continuously monitored and any radioactive or hazardous substances will be captured using high efficiency particulate air filters to ensure that no airborne contaminants are released into the environment;
  - Liquid effluents would be treated using a container water deionizer system to meet the release criteria specified by the CNSC and the City of Saskatoon.
- The Commission is satisfied that the environmental protection review conducted by CNSC staff was appropriate for this licence amendment and that the NSCA provides a strong regulatory framework for environmental protection.
- 19. Based on the information provided for this hearing, the Commission concludes that the licence amendment is not a designated project under CEAA 2012 and that an EA under CEAA 2012 is not required prior to its approval. Further, the Commission is satisfied that SRC has made, and will continue to make, adequate provision for the protection of the environment throughout the decommissioning activities to be authorized by this amendment.

#### 4.0 ISSUES AND COMMISSION FINDINGS

- 20. In making its licensing decision, the Commission considered a number of issues and submissions relating to SRC's qualification to carry out the licensed activities that the amended licence would authorize. The Commission also considered the adequacy of the proposed measures for protecting the environment, the health and safety of persons, national security and international obligations to which Canada has agreed.
- 21. SRC submitted a licence amendment application for the SRCSF on December 14, 2018. In its consideration of this matter, the Commission examined the completeness of the application and the adequacy of the information submitted by the SRC, as

<sup>&</sup>lt;sup>4</sup> S.C. 2019, c. 28, s. 1

<sup>3</sup> SOR/2019-285

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N. Greencorn	Senior Project Officer, Waste and Decommissiong Division	
B. Thériault	Dosimetry Specialist, Radiation Protection Division	
W. Islam	Project Officer, Canadian Nuclear Laboratories Regulatory Program Division	

	Intervenors	
See Appendix A		

Licence: Amended

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#### 1.0 INTRODUCTION

- The Saskatchewan Research Council (SRC) has applied to the Canadian Nuclear Safety Commission<sup>1</sup> for the amendment of the Non-Power Operating Reactor Licence for its SLOWPOKE-2 reactor facility located at the SRC Environmental Analytical Laboratories complex in Saskatoon, Saskatchewan. The current licence, NPROL-19.00/2023, expires on June 30, 2023. SRC has requested an amendment of the licence to authorize the decommissioning of the SRC SLOWPOKE-2 reactor facility (SRCSF).
- 2. The current licence authorizes SRC to operate the SRCSF and to transition the reactor into a safe state, but does not authorize SRC to decommission the reactor. Prior to transitioning into a safe state, the SRCSF provided a source of neutrons for neutron activation analysis and isotope production. It was also used for teaching purposes in conjunction with the University of Saskatchewan.
- 3. SRC is seeking to decommission its SRCSF at this time because it has been able to replace the reactor's analytical capabilities with alternative technologies at SRC's environmental analytical laboratories. The proposed licence amendment would authorize SRC to decommission the SRCSF to achieve an end-state of unrestricted use. This includes dismantling the reactor, segregating and removing the materials for storage, and restoring the site to its original state.
- 4. In June 2019, up to \$15,000 in funding to participate in this licence amendment process was made available to Indigenous groups, not-for-profit organizations and members of the public through the CNSC's Participant Funding Program (PFP). A Funding Review Committee (FRC) independent of the CNSC recommended that up to \$14,714 in participant funding be provided to two applicants. These applicants were required, by virtue of being awarded participant funding, to submit a written intervention and/or an oral presentation at the public hearing commenting on SRC's application.

#### Issues

- 5. In considering the application, the Commission was required to decide:
  - a) what environmental assessment review process to apply in relation to this application;
  - b) whether SRC is qualified to carry on the activity that the amended licence would authorize; and

<sup>&</sup>lt;sup>1</sup> The Canadian Nuclear Safety Commission is referred to as the "CNSC" when referring to the organization and its staff in general, and as the "Commission" when referring to the tribunal component

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c) whether, in carrying on that activity, SRC would make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

#### Public Hearing

- 6. On June 12, 2019, the Commission issued a notice of public hearing in writing for SRC's licence amendment application. Following its publication, the Commission received a request from the Canadian Environmental Law Association (CELA) on behalf of Northwatch, the Inter-Church Uranium Committee Educational Cooperative (ICUCEC) and the Concerned Citizens of Renfrew County and Area (CCRCA) to allow for oral interventions, a longer intervention submission period, and to offer participant funding in relation to SRC's application. Following the Commission's consideration of this request, the Commission, in recognition of demonstrated public interest in SRC's application, published a revised notice of public hearing on June 27, 2019 for an oral hearing. The revised notice provided for a 30-day period to seek intervenor status as per the *Canadian Nuclear Safety Commission Rules of Procedure*<sup>2</sup> (Rules of Procedure). Intervenors were provided an opportunity to intervene in writing and orally and were offered up to \$15,000 in participant funding through the PFP.
- 7. Pursuant to section 22 of the NSCA, the President established a Panel of the Commission to consider the information presented for a public hearing held on September 26, 2019 in Ottawa, Ontario. The public hearing was conducted in accordance with the Rules of Procedure. During the public hearing, the Commission considered written submissions and heard oral presentations from SRC (CMD 19-H100.1A) and CNSC staff (CMD 19-H100.A). The Commission also considered oral and written submissions from seven intervenors (see Appendix A for a list of interventions). The hearing was audiocast live via the CNSC website, and audio archives are available on the CNSC's website.

#### 2.0 DECISION

8. Based on its consideration of the matter, as described in more detail in the following sections of this *Record of Decision*, the Commission concludes that SRC is qualified to carry on the activity that the amended licence will authorize. The Commission is of the opinion that SRC, in carrying on that activity, will make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. Therefore,

<sup>2</sup> SOR/2000-211.

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the Commission, pursuant to section 24 of the Nuclear Safety and Control Act, amends the Non-Power Reactor Operating Licence issued to the Saskatchewan Research Council for its SLOWPOKE-2 reactor facility located in Saskatoon, Saskatchewan to authorize SRC to decommission the facility. The amended licence, NPROL-19.01/2023, remains valid until June 30, 2023.

- 9. The Commission is satisfied that an environmental assessment (EA) under the Canadian Environmental Assessment Act, 2012<sup>3</sup> (CEAA 2012) was not required in this matter and considers the environmental protection review that was conducted by CNSC staff to be acceptable and thorough.
- The Commission amends Part IV a) of SRC's licence as recommended by CNSC staff in CMD 19-H100, to authorize SRC to decommission the SRCSF.
- 11. The Commission does not amend the licence period as recommended by CNSC staff in CMD 19-H100. The Commission is satisfied that the start date of the licence need not change. The licence period shall remain as "July 1, 2013 to June 30, 2023" with the authorization to decommission taking effect as of the date of this decision.
- 12. The Commission anticipates that, following its decision in this matter. CNSC staff will update SRC's Licence Conditions Handbook (LCH) to include references to the Detailed Decommission Plan (DDP) and other documents as presented during this hearing. A draft amended LCH was not included in the hearing materials as is usual; CNSC staff will update it following this decision.
- 13. The Commission would like to note its displeasure that, during the hearing, it did not receive satisfactory information about how the waste would be characterized during the decommissioning of the SRCSF or about the specific radionuclide activities data. Should SRC submit an application to abandon the SRCSF, the detailed waste characterization data and a confirmation of the accuracy of the estimates will be required to be submitted by SRC, and reviewed by CNSC staff.

#### 3.0 ENVIRONMENTAL ASSESSMENT

- In coming to its decision, the Commission was first required to determine whether an EA was required.
- 15. SRC's application was made December 14, 2018, at which time CEAA 2012 and its regulations provided the requirements for EA for nuclear projects. The decommissioning of an existing nuclear reactor is not included on the Designated Project list for an EA, as decommissioning is not an activity identified in the *Regulations Designating Physical Activities*.

<sup>3</sup> S.C. 2012, c. 19, s. 52

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16. The Impact Assessment Act<sup>4</sup> (IAA) came into force August 28, 2019. Under the IAA and the Physical Activities Regulations<sup>5</sup> made under it, impact assessments (IA) will be conducted on projects identified as having the greatest potential for adverse environmental effects in areas of federal jurisdiction. While CEAA 2012 and not the IAA applies to this project, the Commission notes that the decommissioning of an existing reactor is not an activity identified in the regulations for an IA under the IAA.

17. The Commission considered the completeness and adequacy of the environmental protection review under the NSCA and its regulations that CNSC staff conducted for this licence amendment. CNSC staff findings for the proposed SRCSF decommissioning included, but were not limited to:

- Radiation doses to the public resulting from decommissioning activities are estimated to be 0.1 mSv, well below the regulatory dose limit for members of the public of 1.0 mSv;
- Air will be continuously monitored and any radioactive or hazardous substances will be captured using high efficiency particulate air filters to ensure that no airborne contaminants are released into the environment;
- Liquid effluents would be treated using a container water deionizer system to meet the release criteria specified by the CNSC and the City of Saskatoon.
- The Commission is satisfied that the environmental protection review conducted by CNSC staff was appropriate for this licence amendment and that the NSCA provides a strong regulatory framework for environmental protection.
- 19. Based on the information provided for this hearing, the Commission concludes that the licence amendment is not a designated project under CEAA 2012 and that an EA under CEAA 2012 is not required prior to its approval. Further, the Commission is satisfied that SRC has made, and will continue to make, adequate provision for the protection of the environment throughout the decommissioning activities to be authorized by this amendment.

#### 4.0 ISSUES AND COMMISSION FINDINGS

- 20. In making its licensing decision, the Commission considered a number of issues and submissions relating to SRC's qualification to carry out the licensed activities that the amended licence would authorize. The Commission also considered the adequacy of the proposed measures for protecting the environment, the health and safety of persons, national security and international obligations to which Canada has agreed.
- 21. SRC submitted a licence amendment application for the SRCSF on December 14, 2018. In its consideration of this matter, the Commission examined the completeness of the application and the adequacy of the information submitted by the SRC, as

<sup>&</sup>lt;sup>4</sup> S.C. 2019, c. 28, s. 1 <sup>5</sup> SOR/2019-285

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required by the NSCA, the *General Nuclear Safety and Control Regulations*<sup>6</sup> (GNSCR) and other applicable regulations made under the NSCA.

22. In CMD 19-H100.A, CNSC staff provided responses to some of the questions and issues raised by intervenors. This *Record of Decision* reflects the Commission's consideration of matters as discussed during the hearing and as raised in written submissions.

#### 4.1 Human Performance Management

- 23. The Commission assessed SRC's human performance management programs which encompass activities that enable effective human performance through the development and implementation of processes that ensure that SRC staff are sufficient in number in all relevant job areas and have the necessary knowledge, skills, procedures and tools in place to safely carry out their duties. During the current licence period. CNSC staff rated SRC's performance in this safety and control area (SCA) as "satisfactory."
- 24. The Commission examined the information submitted by SRC regarding its human performance program. SRC submitted that the SRCSF decommissioning project included work that its personnel did not normally perform and, therefore, the decommissioning work would be contracted to and carried out by Candu Energy Inc. (Candu Energy), which has specific training and experience for these types of projects.
- 25. The Commission considered the information submitted by SRC about its personnel training programs, noting that SRC's programs met the specifications of REGDOC-2.2.2, Personnel Training.<sup>7</sup> SRC submitted information about its decommissioning training program, which applies to all workers and contractors who are required to perform work, as set out in SRC's Decommissioning Training Plan for SRC SLOWPOKE-2 Facility.<sup>8</sup>
- 26. SRC reported that all Candu Energy staff were required to complete basic industrial safety and radiological training and that all personnel in direct operating positions would be trained in accordance with Candu Energy's Systematic Approach to Training (SAT) program, unless their current CNSC certification covered the activities to be performed during decommissioning. SRC further reported that a review of training and qualifications would be conducted for employees assigned to work at the SRC facility, noting that, as part of the SAT process, a Training Needs Analysis was conducted to examine the tasks involved and the qualification of the personnel assigned to perform the tasks. SRC reported that this analysis produced a matrix which showed the

<sup>6</sup> SOR/2000-202.

<sup>&</sup>lt;sup>7</sup> CNSC Regulatory Document REGDOC-2.2.2, Personnel Training, 2016.

<sup>&</sup>lt;sup>8</sup> SRC, SLOWPOKE-2 Detailed Decommissioning Plan, March 04, 2019

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additional training modules or courses were required to fill any gaps in a worker's required knowledge and skills.

- 27. CNSC staff reviewed the SRC's detailed training plan, including the advanced training schedule, which provides timelines for all tasks requiring training as identified in the job and task analysis. From this review, CNSC staff were satisfied that the decommissioning training and evaluation program met expectations.
- 28. The Commission enquired as to whether workers assigned to the decommissioning of the SRCSF were also involved during the decommissioning of the University of Alberta (U of A) SLOWPOKE-2 reactor. An SRC representative responded that, although not all of the workers present during the U of A decommissioning project were working on the SRCSF decommissioning, several were.
- 29. The Commission assessed the SRC's programs for the certification of employees in certain positions at the SRCSF. SRC submitted that, under its operating licence and pursuant to the *Class I Nuclear Facilities Regulations*<sup>9</sup> (Class I Regulations), the positions requiring a valid CNSC certification included: reactor operator, reactor engineer, and reactor technician.
- 30. CNSC staff submitted that there were three SLOWPOKE-2 reactor operators employed by SRC who were certified by the CNSC, and the reactor engineer and the reactor technician were Candu Energy employees, who were also certified by the CNSC to work on the SRC SLOWPOKE-2 reactor.
- 31. Based on the information presented during this hearing, the Commission is satisfied that SRC has appropriate training and certification programs in place at the SRCSF for carrying out the decommissioning of the SRCSF. The Commission is also satisfied that SRC's programs meet the objectives of REGDOC-2.2.2.
- The Commission is satisfied that appropriate programs are in place for contracted Candu Energy workers.
- 33. Based on its consideration of the information presented on the record for this hearing. the Commission concludes that SRC has appropriate programs in place and that current efforts related to human performance management provide a positive indication of SRC's ability to adequately carry out the proposed decommissioning activities at the SRCSF.

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#### **4.2 Radiation Protection**

- 34. As part of its evaluation of the adequacy of the measures for protecting the health and safety of persons, the Commission considered the performance of SRC in the area of radiation protection. The Commission also considered how SRC's radiation protection program specified that radiation doses to persons and contamination would be monitored, controlled and kept as low as reasonably achievable (ALARA), with social and economic factors taken into consideration, during the decommissioning of the SRCSF. Throughout the current licence period thus far, CNSC staff rated SRC's performance in this SCA as "satisfactory."
- 35. The Commission considered the information provided by SRC and CNSC staff to assess whether the SRC radiation protection program satisfied the requirements of the *Radiation Protection Regulations*.<sup>10</sup> SRC submitted that Candu Energy's Radiation Protection Plan for the decommissioning of the SRCSF was based on Candu Energy's radiation protection program requirements used at CANDU licensed sites and would see to it that doses to workers would remain below regulatory limits during the decommissioning project.
- 36. SRC submitted that, in order to keep doses ALARA, a radiation protection surveyor would provide oversight throughout the decommissioning work and that workers would perform decommissioning work at a safe distance from the radiation source using cranes and extension tools. SRC further submitted that the use of personal dosimetry in radiological work zones to control the spread of contamination would be utilized.
- 37. CNSC staff submitted that, throughout the current licence period, SRC had implemented an appropriate and effective radiation program at the SRCSF that satisfied the regulatory requirements set out in the *Radiation Protection Regulations*. CNSC staff also reported that SRC used a licensed dosimetry service to monitor, assess, record and report doses received by workers, noting that the workers in the SRCSF were not designated as nuclear energy workers (NEWs). CNSC staff further submitted that doses to public and the workers during the current licence period were well below the public annual whole-body regulatory dose limit of 1 mSv.<sup>11</sup> CNSC staff noted that the maximum effective dose to an SRC worker during the current licence period was 0.28 mSv, well below the 1 mSv regulatory dose limit.
- 38. CNSC staff reported that radioactive fields to which workers may be exposed during the decommissioning project were estimated to be between 0.30 µSv/h and 0.37 µSv/h. CNSC staff further submitted that, based on previous decommissioning projects, SRC established action levels<sup>12</sup> for the decommissioning project of 1 mSv effective dose, 50

<sup>10</sup> SOR/2000-203

<sup>11</sup> SOR/2000-203. subsection 13(1)

<sup>&</sup>lt;sup>12</sup> The Radiation Protection Regulations define an "action level" as a specific dose of radiation or other parameter that, if reached, may indicate a loss of control of part of a licensee's radiation protection program and triggers a requirement for specific action to be taken.

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mSv for skin dose and 50 mSv for extremities. CNSC staff submitted that there would be real time monitoring of alpha, beta, and gamma radiation using Improved Chemical Agent Monitors (ICAM).

- 39. The Commission asked for information in regard to a concern raised by the National Council of Women of Canada with respect to the estimated collective dose for the decommissioning of the SRCSF. A Candu Energy representative responded that the total dose received by workers in the three-month duration of the U of A decommissioning was 0.26 mSv and that Candu Energy was anticipating a similar collective dose for the SRCSF decommissioning. The Candu Energy representative added that for the activities that Candu Energy had carried out at SRCSF to date (including the removal and shipment of the fuel from the reactor), the collective dose was 0.165 mSv.
- 40. The Commission asked SRC to opine on which decommissioning activity was considered the most hazardous from a radiological perspective. A Candu Energy representative responded that the removal of the beryllium annulus was the most hazardous activity with respect to radiation, as the beryllium annulus had to be brought up to the surface of the reactor pool and stored in a shielding container while workers were present.
- 41. Further on that topic, the Commission asked about what was considered to be the worst case scenario during the SLOWPOKE-2 decommissioning and what controls were in place to prevent such an accident from occurring. The Candu Energy representative responded that the worst case scenario would be a worker standing near the beryllium annulus for an extended duration of approximately four hours which would result in a regulatory dose limit for a member of the public of 1 mSv. The Candu Energy representative added that, in order to prevent this from occurring, radiation detectors to monitor radiation levels, and radiation protection personnel to monitor doses to workers, were in place. The Commission was satisfied with the information provided.
- 42. Following the concerns about alpha hazards expressed in the intervention from the National Council of Women of Canada, the Commission asked if alpha radiation hazards were anticipated during the decommissioning of the SRCSF and whether SRC's radiation protection program would adequately provide for protection in regard to such hazards. CNSC staff responded that, although there were alpha hazards present in the SRCSF, SRC had provisions in place such as contamination monitoring; real-time monitoring of alpha, beta, and gamma radiation; and the use of personal protective equipment such as respiratory systems and radiation protection coveralls to limit the intake of alpha particles.
- 43. The Commission asked for information regarding the methodology that was used to determine that five samples from the pool floor would be adequate to ensure that no contamination would be left behind in the SRCSF. A Candu Energy representative responded that the samples were to confirm the computer model prediction that provided the activity on the reactor pool floor. The Candu Energy representative added

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that once the results were validated, they would know exactly how much concrete would need to be removed from the reactor pool to ensure that there will be no contamination left behind in the SRCSF.

- 44. Based on the information considered for this hearing, the Commission is satisfied that the ALARA concept is adequately applied to all SRCSF activities.
- 45. Based on the information provided on the record for this hearing, the Commission concludes that, given the mitigation measures and safety programs that are in place and will be in place to control radiation hazards. SRC provides for, and will continue to provide for, the adequate protection of the health and safety of persons and the environment throughout the decommissioning of the SRCSF.
- 46. The Commission is satisfied that SRC's radiation protection program at the SRCSF will continue to meet the requirements of the *Radiation Protection Regulations* during the decommissioning of the facility.

#### 4.3 Environmental Protection

- 47. The Commission examined SRC's environmental protection programs at the SRCSF, which are intended to identify, control and monitor all releases of radioactive and hazardous substances, and aim to minimize the effects on the environment which may result from the licensed activities. These programs include effluent and emissions control, environmental monitoring and estimated doses to the public. CNSC staff rated SRC's performance in this SCA as "satisfactory" during the current licence period.
- The Commission considered whether the SRCSF environmental protection programs adequately met the specifications of REGDOC-2.9.1, Environmental Protection Policies, Programs and Procedures.<sup>13</sup>
- 49. CNSC staff reported that SRC's environmental protection program met the requirements of the Class I Regulations and that radiological and non-radiological releases at the SRCSF remained below regulatory limits during the current licence period.
- 50. The Commission considered SRC's programs to control the release of effluents and emissions from the SRCSF to the environment. In its written submission, SRC submitted that the release of radioactive material was expected to be below the regulatory limits and that airborne emissions would be continuously monitored and filtered using high efficiency particulate air filters prior to being released into the environment during the decommissioning of the SRCSF.

<sup>&</sup>lt;sup>13</sup> CNSC Regulatory Document REGDOC-2.9.1, Environmental Protection Policies, Programs and Procedures, 2013.

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- The Commission assessed SRC's programs to mitigate risk to members of the public 51 from hazardous substances discharged from the SRCSF. CNSC staff submitted that airborne releases from the SRCSF were below regulatory limits and that the dose to the public was estimated to be 0.010 mSv as compared to the regulatory limit for the dose to a member of the public of 1 mSv. SRC submitted that it would have mitigation measures in place to ensure that airborne emissions are minimal and that operating experience had shown no instances where airborne radioactivity was detected.
- 52. In its written submission, SRC submitted that approximately 28,380 L of contaminated reactor pool water to be disposed of during the decommissioning process will be treated using a container water deionizer system prior to release into the City of Saskatoon sewer system. SRC further submitted that the level of activity in the pool water would be subject to CNSC release criteria as detailed in the Nuclear Substances and Radiation Devices Regulations14 (NSRDR) and City of Saskatoon by-laws for hazardous substances.15
- In consideration of concerns raised by the National Council of Women of Canada 53. regarding the release of liquid waste into the City of Saskatoon sewage system, the Commission asked CNSC staff to elaborate on the type of assessment that was conducted with respect to the cumulative risks to the environment associated with SRC's liquid waste disposal proposal. CNSC staff stated that, when assessing whether liquid waste could be released into the municipal sewage system, it had to be ascertained that the waste was below the clearance levels set out in Appendix R of REGDOC-1.6.1, Licence Application Guide: Nuclear Substances and Radiation Devices, Version 216, and IAEA-TECDOC-1000, Clearance of Materials Resulting from the Use of Radionuclides in Medicine, Industry and Research.<sup>17</sup> CNSC staff further added that these clearance levels were derived to ensure that no member of the public received an annual dose of more than 0.01 mSv.
- Based on the assessment of the application and the information provided on the record 54. at the hearing, the Commission is satisfied that, given the mitigation measures and safety programs that are in place to control hazards. SRC will provide adequate protection to the health and safety of persons and the environment throughout the decommissioning activities.
- The Commission is satisfied that the SRCSF environmental protection programs 55 continue to meet the specifications of REGDOC-2.9.1.

<sup>13</sup> https://www.saskatoon.ca/services-residents/power-water/water-wastewater/sewer-use-bylaw

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<sup>14</sup> SOR/2000-207

<sup>16</sup> CNSC Regulatory Document REGDOC-1.6.1, Licence Application Guide: Nuclear Substances and Radiation Devices, Version 2 <sup>17</sup> INTERNATIONAL ATOMIC ENERGY AGENCY, Clearance of Materials Resulting from the Use of

Radionuclides in Medicine, Industry and Research, IAEA-TECDOC-1000, IAEA, Vienna (1998).

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#### 4.4 Waste Management

- 56. The Commission assessed SRC's site-wide waste management program. During the current licence period, CNSC staff assessed SRC's performance in this SCA, including waste minimization, segregation, characterization, and storage programs, as "satisfactory."
- 57. SRC submitted that waste generated at the SRCSF could be categorized as radioactive waste, non-radioactive hazardous waste, and non-radioactive and non-hazardous waste. SRC further submitted that it has an effective waste management plan and that all waste generated during the SRCSF's decommissioning would be managed in accordance with licensing requirements.
- 58. SRC provided the Commission with information regarding its waste minimization strategy reporting that, in order to minimize waste. SRC would decontaminate, segregate, reuse and recycle non-radioactive waste material to the extent possible and that the remaining waste will be shipped to either a landfill disposal site or a licensed waste management facility.
- 59. SRC submitted that non-radioactive chemical waste would be sent to a licensed hazardous waste management facility and that demolition debris that is determined to be below the release limits would be send to a landfill that is authorized to receive the waste. SRC further submitted that all waste would be transported in accordance with the *Transportation of Dangerous Goods Regulations*.<sup>12</sup>
- 60. CNSC staff reported that SRC's Decommissioning Waste Management Plan (DWMP) met the specifications of CSA N292.3-08, Management of low and intermediate-level radioactive waste,<sup>19</sup> and N292.0-14, General principles for the management of radioactive waste and irradiated fuel.<sup>20</sup> CNSC staff submitted that SRC's DWMP and supporting documents were satisfactory and met licensing requirements.
- 61. SRC reported that the reactor core containing the used highly enriched uranium fuel had been transported from the SRCSF to Savannah River, South Carolina, in accordance with the Canada-US agreement to return highly enriched uranium fuel to the country of origin. SRC further reported that the fuel had been transported in accordance with a CNSC-issued transportation licence in a Type B container. specifically an F-257 flask which had been certified by the CNSC.
- 62. The Commission enquired as to the volume of non-radioactive hazardous waste that is expected from the proposed decommissioning project. An SRC representative responded that the amount of non-radioactive hazardous waste would be minimal, approximately three car batteries that would be sent for recycling.

<sup>18</sup> SOR/2001-286

<sup>19</sup> N292.3, Management of low and intermediate-level radioactive waste, CSA Group, 2008 and 2014.

<sup>20</sup> N292.0-14, General principles for the management of radioactive waste and irradiated fuel, CSA Group, 2014.

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- 63. On an issue raised by the Concerned Citizens of Renfrew County and Area (CCRCA). that radioactive waste resulting from the decommissioning of the SRCSF would be transported to the Canadian Nuclear Laboratories (CNL) site in Chalk River, Ontario. the Commission enquired about whether SRC would have any liability in respect of the waste once the title of the waste was transferred to CNL. CNSC staff responded that once the waste has been accepted by CNL. CNL will be the owner of the waste. An SRC representative further added that SRC would not hold any long-term liability in regard to the SRCSF radioactive waste following its transfer to Chalk River Laboratories (CRL). The Commission was satisfied with the information provided.
- 64. Noting the interventions submitted by CCRCA. Northwatch and the National Council of Women regarding alternative decommissioning options, the Commission asked SRC if the removal of the reactor concrete pool in its entirety had been considered. A Candu Energy representative responded that the general practice in decommissioning SLOWPOKE-2 reactors is to survey and remove concrete wherever there is contamination above unconditional clearance levels as specified in the NSRDR. The Candu Energy representative added that although it was possible to remove the entire reactor pool, it is not the general practice as there is no benefit of removing concrete that is below the clearance levels.
- On a concern raised by Nuclear Waste Waste + Inter-Church Uranium Committee 65. Educational Cooperative (NWW + ICUCEC). the Commission requested details about Canada's regulatory framework for the decommissioning of nuclear facilities. CNSC staff responded that the high-level requirements are set out in the regulations and the policy for waste management and decommissioning is set out in Natural Resources Canada's (NRCan) Radioactive Waste Policy Framework<sup>21</sup> and CNSC regulatory document REGDOC-2.11, Framework for Radioactive Waste Management and Decommissioning in Canada.<sup>22</sup> CNSC staff added that there is a Regulatory Guide G-219, Decommissioning Planning for Licensed Activities, 23 for decommissioning, and CNSC staff is currently in the process of developing regulatory documents for both waste management and decommissioning.
- 66. The Commission requested information on the concerns expressed by NWW + ICUCEC, Northwatch and CCRCA that the U of A SLOWPOKE-2 reactor was abandoned without having removed all the radiological hazards. A Candu Energy representative responded that the initial post-decommissioning measurements had shown that radiological hazards were still present and that further decontamination had to be done. CNSC staff confirmed this to be the case and reported that, when CNSC staff carried out the final surveys as part of the end-state inspection, dose rates were below the industry standard clearance level of 0.5 µSv/hour.

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<sup>21</sup> Retrieved from https://www.nrcan.gc.ca/energy/energy-sources-distribution/uranium-nuclear-energy/radioactivewasterradioactive-waste-policy-framework/7225 22 CNSC Regulatory Document REGDOC-2.11, Framework for Radioactive Waste Management and

Decommissioning in Canada, 2018.

<sup>&</sup>lt;sup>23</sup> CNSC Guidance Document G-219, Decommissioning Planning for Licensed Activities, 2000.

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- 67. The Commission notes the concerns raised by intervenors with respect to the abandonment of the U of A reactor facility and their uncertainty concerning the unconditional release levels at the time of abandonment of that facility. The Commission authorized the U of A to abandon its facility upon receipt of its application and the evidence that it had met the regulatory requirements. When SRC has completed its decommissioning activities, any licence application it makes to be authorized to abandon will be subjected to the same regulatory requirements. The Commission will require evidence to satisfy itself, before making a decision, of the completion of satisfactory decommissioning. That is not the subject of this application.
- 68. On an issue raised by Northwatch regarding the terminology used to describe the decommissioning of the SLOWPOKE-2 reactor, the Commission asked staff to clarify whether the proposed decommissioning project could be referred to as "entombment" or "in situ waste disposal". CNSC staff responded that, as per international standards that speak to all options of decommissioning. "in situ" refers to leaving the reactor in place and that the decommissioning of the SRCSF could not be defined as "in situ waste disposal" as there will be no parts of the reactor left behind and the facility will be free of contamination. The Commission is satisfied with this information and does not consider the proposed decommissioning of the SRCSF to be an "in situ waste disposal" or "entombment."
- 69. The Commission enquired as to how SRC would treat the liquid waste in the event that it is still radioactive after passing through the ion exchange column. An SRC representative stated that the radioactivity in the liquid waste has already been brought down to the unconditional release limits. A Candu Energy representative added that SRC had a backup ion exchange column that was always available in the event that the water had to be further processed in order to meet the release limits. The Commission was satisfied with the information provided.
- 70. Noting the concerns raised by the Nation Council of Women of Canada about the disposal of non-radioactive liquid waste in the City of Saskatoon's landfill and municipal sewage system, the Commission enquired about the consultation that SRC had carried out with the City of Saskatoon in regard to sending non-radioactive waste materials to landfills and the sewage system. An SRC representative responded that SRC maintained an ongoing discussion with the City of Saskatoon on these issues.
- 71. On a concern raised by Northwatch, the Commission asked for clarification as to the criteria for the classification of radioactive waste as low or intermediate level. CNSC responded that there are a number of considerations that need to be taken into account when characterizing waste, such as the radioisotope and the decay scheme. CNSC staff added that upon reviewing SRC's application to amend, some inconsistencies were found and were taken back to the licensee to address.

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- 72. The Commission expressed concern as to whether processes are in place to ensure that waste is adequately characterized given the presence of hard to measure radionuclides. CNSC staff responded that waste is characterized based on the waste receivers' acceptance criteria and also in accordance with CSA N292.0-14. A Candu Energy representative responded that the presence of radionuclides in waste resulting from the SRCSF decommissioning had been estimated using an industry standard computation code and that the estimates would be validated as measurements were taken during the decommissioning process.
- 73. Further on that topic, the Candu Energy representative added that, although not all the radionuclides such as Nickel-59. Tritium, and Calcium-41 had been measured, the ones that were measured contributed to approximately 99% of the radionuclides with respect to the unconditional release limit. During the hearing, the Commission did not receive satisfactory confirmation that the waste would be adequately characterized and anticipates that reliable data will be available upon conducting decommissioning activities. Should SRC submit an application to abandon the SRCSF, the detailed waste characterization data and a confirmation of the accuracy of the estimates will be required to be submitted by SRC, and reviewed by CNSC staff.
- 74. The Commission enquired about the assessment that institutional control for the decommissioned SRCSF would not be required. CNSC staff responded that, because the proposed decommissioning strategy is for complete decommissioning, the SRCSF would be cleaned to below the unconditional release limits and therefore no CNSC regulatory control would be required, if the strategy materializes.
- 75. Based on the above information and consideration of the hearing materials, the Commission is satisfied that, according to SRC's decommissioning plans, there will be no waste left at the SRCSF and that SRC has appropriate programs in place to safely characterize and manage the waste generated at the SRCSF as part of decommissioning.

#### 4.5 Packaging and Transport

76. The Commission examined SRC's packaging and transport program. Packaging and transport covers the safe packaging and transport of nuclear substances and radiation devices to and from the licensed facility. The licensee must adhere to the *Packaging and Transport of Nuclear Substances Regulations* 2015 (PTNSR, 2015).<sup>24</sup> and Transport Canada's *Transportation of Dangerous Goods Regulations* for all shipments. During the licence period, CNSC staff rated SRC's performance in this SCA as "satisfactory."

<sup>24</sup> SOR/205-145

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- 77. On a concern raised by the Northwatch regarding the education and training for first responders, the Commission asked CNSC staff to comment on the training provided to first responders along the transportation route of radioactive waste, specifically, the rural and remote areas along the route. CNSC staff responded that all first responders in Canada receive HAZMAT training which includes radioactive material emergency management training. CNSC staff added that an emergency number through which any necessary information on the specific material being transported could be obtained in the event of emergency was required to be included in shipping documents. CNSC staff also stated that the CNSC has a duty officer and Transport Canada had the Canadian Transport Emergency Centre (CANUTEC) which are available at all times to provide technical information and guidance in the event of an emergency.
- 78. Noting that approximately 8 m<sup>3</sup> of radioactive waste would be generated through the decommissioning of the SRCSF, the Commission enquired as to how many shipments of radioactive waste would be sent to CRL. An SRC representative responded that it would be a single shipment of three Type A packages.
- 79. Based on the information presented on the record for this hearing, the Commission is satisfied that SRC is meeting, and will continue to meet, regulatory requirements regarding packaging and transport of waste generated during the decommissioning of the SRCSF.

#### 4.6 Indigenous Engagement and Public Information

#### 4.6.1 Participant Funding Program

- 80. The Commission assessed the information provided by CNSC staff regarding public engagement in the licensing process as enhanced by the CNSC's Participant Funding Program (PFP). CNSC staff submitted that, in June 2019, up to \$15,000 in funding to participate in this licensing process was made available to Indigenous groups, members of the public and other stakeholders to review SRC'S licence amendment application and associated documents, and to provide the Commission with value-added information through topic-specific interventions.
- 81. A Funding Review Committee (FRC), independent of the CNSC, recommended that two applicants be provided with up to \$15,000 in participant funding. These applicants were required, by virtue of being awarded participant funding, to submit a written intervention and to make an oral presentation at the public hearing on SRC's licence amendment application.
- 82. Based on the information submitted for this hearing, the Commission is satisfied that Indigenous groups, members of the public and other stakeholders were encouraged to participate in this process.

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#### 4.6.2 Indigenous Engagement

- 83. The common law duty to consult with Indigenous peoples applies when the Crown contemplates action that may adversely affect established or potential Aboriginal and/or treaty rights. The CNSC, as an agent of the Crown and as Canada's nuclear regulator, recognizes and understands the importance of building relationships and engaging with Canada's Indigenous peoples. The CNSC ensures that its licensing decisions under the NSCA uphold the honour of the Crown and consider Indigenous peoples' potential or established rights pursuant to section 35 of the Constitution Act, 1982.<sup>25</sup>
- S4. CNSC staff submitted that, because the proposed decommissioning activities would be conducted within the facility with no adverse impact to the surrounding environment, the duty to consult does not arise with respect to the proposed licence amendment. CNSC staff further submitted that the proposed activities would not have an impact on potential or established Indigenous and/or treaty rights.
- 85. Noting the concerns expressed about the impacts on Indigenous groups along the transportation route to CRL, the Commission enquired about the duty to consult with Indigenous communities in relation to this activity. CNSC staff submitted that the transportation of radioactive materials is heavily regulated and safety during transport is inherent in the CNSC's packaging and certification process which is based in accordance with the PTNSR, 2015. CNSC staff added that although they are of the opinion that there was no impact to Indigenous community or treaty rights along the route, participant funding had been offered. No request from Indigenous communities for funding had been made.
- Based on the information provided for this hearing, the Commission is satisfied that Indigenous engagement activities carried out for this licence amendment were adequate.

#### 4.6.3 Public Information

87. The Commission assessed SRC's public information and disclosure program (PIDP) for the SRCSF. A public information program is a regulatory requirement for licence applicants and licensed operators of Class I nuclear facilities. Paragraph 3(j) of the Class I Nuclear Facilities Regulations<sup>26</sup> requires that licence applications include

"the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed."

<sup>&</sup>lt;sup>25</sup> Constitution Act, 1982, Schedule B to the Canada Act 1982, 1982, c. 11 (U.K.).

<sup>26</sup> SOR/2000-204.

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- 88. The Commission also assessed how SRC's PIDP met the specifications of RD/GD-99.3. Public Information and Disclosure<sup>27</sup>. SRC provided the Commission with information regarding its PIDP including the mechanisms in place to provide the public information related to its operations and a dedicated web page for the decommissioning of the SRCSF. CNSC staff informed the Commission that SRC has undertaken a number of initiatives in support of its PIDP and added that there has been a very low level of public interest regarding the decommissioning of the SRCSF.
- 89. SRC submitted that it held a public meeting on December 5, 2018 to provide information to the public about its decommissioning plans and answer any questions that may arise. SRC further submitted that the interest from the public was minimal and that it would continue to share information via newsletters and invite members of the public to submit comments or concerns.
- 90. The Commission requested additional details about the public information forum held at the SRCSF on December 5, 2018, including attendance and the concerns that were raised. An SRC representative responded that approximately seven people came to the information forum, representing various groups and SRC's stakeholders, and that the concerns were similar to the concerns raised by intervenors in this hearing.
- 91. In consideration of a concern raised by NWW + ICUCEC, the Commission asked CNSC staff if there were lessons learned reports for the previous SLOWPOKE-2 decommissioning projects and if they were publicly available. CNSC staff responded that the lessons learned were a section of the end-state report that the licensee must submit upon the completion of decommissioning and that they were available to the public upon request. CNSC staff added that the end state reports for previous decommissioning projects were available, with the exception of University of Toronto, and that the lessons learnt from the University of Toronto decommissioning project were implemented in other projects such as the increased shielding of the beryllium package. An SRC representative reported that Candu Energy had conducted the decommissioning of the U of A and lessons learned from previous decommissioning projects were incorporated into the work plans developed for the decommissioning of the SRC SLOWPOKE-2 reactor. The Commission was satisfied with the information provided.
- 92. Based on the information presented for this hearing, the Commission is satisfied that SRC's PIDP has and will continue to communicate to the public, information about the health, safety and security of persons and the environment and other issues. This will continue throughout the decommissioning of the SRCSF.
- 93. Recognizing that parts of the end-state report may contain commercially sensitive information, and in anticipation of interest, the Commission expects that SRC share the publicly available portions of the end-state report with interested stakeholders if requested upon completion of the decommissioning project.

<sup>&</sup>lt;sup>27</sup> CNSC Regulatory/Guidance Document RD/GD-99.3. Public Information and Disclosure. 2012.

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4.6.4 Conclusion on Indigenous Engagement and Public Information

- 94. Based on the information presented, the Commission is satisfied that, overall, SRC's PIDP meets regulatory requirements and is effective in keeping Indigenous groups and the public informed of SRC's operations.
- 95. Based on the information presented on the record for this hearing, the Commission is satisfied that this licence amendment will not result in changes to SRC's operations that would cause adverse impacts to any potential or established Indigenous and/or treaty rights.

#### 4.7 Decommissioning Plans and Financial Guarantee

- 96. The Commission requires SRC to have a detailed decommissioning plan for the decommissioning of the SRC SLOWPOKE-2 facility and a long-term management plan for waste produced from the project. In order to ensure that adequate resources are available for safe and secure decommissioning of the SRCSF, the Commission requires that an adequate financial guarantee for realization of the planned activities is put in place and maintained in a form acceptable to the Commission throughout the licence period.
- 97. As part of the licence amendment application, SRC submitted a Detailed Decommissioning Plan (DDP) which describes the decommissioning process for the SRCSF and the measures in place to ensure that the public and the environment are protected during the decommissioning project. CNSC staff reported that the DDP was assessed against the requirements of CNSC Regulatory Guide G-219, Decommissioning Planning for Licensed Activities and CSA N294-09: Decommissioning of Facilities Containing Nuclear Substances<sup>28</sup> and CNSC staff found it to be acceptable.
- 98. CNSC staff submitted that SRC's activities that are authorized under the operating licence included defueling the reactor, maintenance of the reactor, and transport of spent fuel and radioactive waste. CNSC staff further submitted that the defueling of the SLOWPOKE-2 reactor had been subject to a CNSC inspection in which inspectors from the International Atomic Energy Agency (IAEA) participated and found no regulatory non-compliances.
- 99. The Commission asked for clarification in regard to the financial guarantee that SRC has in place for the decommissioning of the SRCSF. CNSC staff submitted that SRC has in place a financial guarantee in the amount of \$5,760,000, which will be used towards decommissioning and that the SRC's Board of Directors had approved expenditures in the amount of up to \$7,500,000. An SRC representative responded that the current financial guarantee in place was in the form of a trust fund for the amount of \$7,500,000 approved by the SRC Board of Directors and accepted by the CNSC.

<sup>28</sup> N294-09 (R2014), Decommissioning of facilities containing nuclear substances, CSA Group, reaffirmed in 2014.

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The SRC representative added that the decommissioning work would be funded out of SRC's operating budget of \$ 5,760,000 and that the trust fund in place would be released to the SRC upon successful decommissioning and final approval from the Commission.

100. Based on the record, the Commission concludes that the detailed decommissioning plan and related financial guarantee for the SRCSF are acceptable for the purpose of the current application for licence amendment.

#### 5.0 CONCLUSION

- 101. The Commission has considered the amendment application submitted by the SRC. Based on its consideration of the information submitted, the Commission is satisfied that the application meets the requirements of the NSCA, the GNSCR and other applicable regulations made under the NSCA.
- 102. The Commission has also considered the information and submissions of the applicant, CNSC staff and all participants as set out in the material available for reference on the record, as well as the oral presentations made by the participants at the hearing.
- 103. The Commission is satisfied that SRC meets the test set out in subsection 24(4) of the Nuclear Safety and Control Act. That is, the Commission is of the opinion that SRC is qualified to carry on the decommissioning activity that the amended licence will authorize and that it will make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.
- 104. Therefore, the Commission, pursuant to section 24 of the Nuclear Safety and Control Act, amends the Non-Power Reactor Operating Licence issued to the Saskatchewan Research Council for its facility located in Saskatoon, Saskatchewan. The amended licence, NPROL-19.01/2023, is valid until June 30, 2023.
- 105. The Commission amends Part IV a) of SRC's licence as recommended by CNSC staff in CMD 19-H100, to authorize it to decommission the SRCSF.
- 106. The Commission would like to note that this decision does not authorize abandonment. Should SRC apply for a licence to abandon, this will be the subject of a different proceeding.
- 107. The Commission anticipates that, following its decision in this matter, CNSC staff will update SRC's Licence Conditions Handbook (LCH) to include references to the Detailed Decommission Plan (DDP) and other documents as presented during this hearing.

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- 108. The Commission considers the environmental protection review that was conducted by CNSC staff to be acceptable and thorough. The Commission is satisfied that an EA under CEAA 2012 was not required for the SRCSF licence amendment application and notes that the NSCA provides a strong regulatory framework for environmental protection.
- 109. The Commission anticipates that, following its decision in this matter, CNSC staff will update SRC's Licence Conditions Handbook (LCH) to include references to the Detailed Decommission Plan (DDP) and other documents as presented during this hearing. A draft amended LCH was not included in the hearing materials following usual practice; CNSC will update it following this decision.

Versh Dec 6,2019

Rumina Velshi Date President. Canadian Nuclear Safety Commission

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## Appendix A - Intervenors

Intervenors - Oral Presentations	Document Number
Concerned Citizens of Renfrew County and Area, represented	CMD 19-H100.5
by O. Hendrickson	CMD 19-H100.5A
National Council of Women of Canada, represented by G. Janes	CMD 19-H100.2
Nortwatch, represented by B. Lloyd	CMD 19-H100.6
	CMD 19-H100.6A
Nuclear Waste Watch and Inter-Church Uranium Committee	CMD 19-H100.8
Educational Cooperative, represented by J. Karban	CMD 19-H100.8A

Intervenors - Written Interventions	Document Number
Elaine Hughes	CMD 19-H100.3
Linda Murphy	CMD 19-H100.4
North American Young Generation in Nuclear	CMD 19-H100.7

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## Appendix B THE AMENDED NON-POWER REACTOR OPERATING LICENCE

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Canadian Nuclear Safety Commission

Commission canadienne n de súreté nucléaire

> Word Ref: e-Doc 5899570 PDF Ref: e-Doc 5905832 File: 2.03

#### NON-POWER REACTOR OPERATING LICENCE SLOWPOKE-2 REACTOR

#### SASKATCHEWAN RESEARCH COUNCIL

I)	LICENCE NUMBER:	NPROL-19.01/2023
II)	LICENSEE:	Pursuant to section 24 of the Nuclear Safety and Control Act, this licence is issued to
		Saskatchewan Research Council 15 Innovation Boulevard Saskatoon, Saskatchewan S7X 0X1
III)	LICENCE PERIOD:	This licence is valid from July 1, 2013, to June 30, 2023, unless otherwise suspended, amended, revoked, or replaced.

#### IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to:

- (a) operate and decommission the Saskatchewan Research Council SLOWPOKE-2 reactor and associated facilities (hereinafter "the facility"), located in the Analytical and Radiochemical Laboratory of the Council in the Innovation Place Research Park, in Saskatoon, Saskatchewan;
- (b) produce, possess, transfer, use, package, manage, and store the nuclear substances that are required for, associated with or arise from the activities described in (a); and
- (c) possess and use prescribed equipment and prescribed information required for, associated with or arise from the activities described in (a).

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#### V) EXPLANATORY NOTES:

- (a) Nothing in this licence shall be construed to authorize non-compliance with any other applicable legal obligation or restriction.
- (b) Unless otherwise provided for in this licence, words and expressions used in this licence have the same meaning as in the Nuclear Safety and Control Act (hereinafter "NSCA") and associated regulations.
- (c) The Saskatchewan Research Council Licence Conditions Handbook (hereinafter "SRC-LCH") provides
  - compliance verification criteria in order to meet the conditions set out in this licence;
  - (ii) information regarding delegation of authority to CNSC staff; and
  - (iii) applicable versions of documents and a process for version control of codes, standards or other documents that are used as compliance verification criteria.

#### VI) CONDITIONS:

#### 1. GENERAL

- 1.1 The licensee shall conduct the activities described in Part IV of this licence in accordance with the licensing basis for the facility, unless otherwise approved in writing by the Commission.
- 1.2 The licensee shall give written notification of changes made to the licensee documents submitted to support the licence application.
- 1.3 The licensee shall maintain a preliminary decommissioning plan for the facility, and shall review and revise the plan at such times as the Commission may require and in any event, no later than ten years from previous revision.
- 1.4 The licensee shall maintain in effect a financial guarantee for decommissioning of facility that is acceptable to the Commission. The licensee shall report annually that the financial guarantee is valid and in effect.
- 1.5 The licensee shall implement and maintain a public information program including a public disclosure protocol.
- 1.6 The licensee shall, in the event of any conflict or inconsistency between licence conditions, codes or standards or regulatory documents used as compliance verification criteria in the SRC-LCH, refer the matter to the Commission for resolution.

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#### 2. MANAGEMENT SYSTEM

2.1 The licensee shall implement and maintain a management system for activities carried out under this licence.

#### 3. HUMAN PERFORMANCE MANAGEMENT

- 3.1 The licensee shall ensure that persons appointed to the positions of reactor engineer, reactor technician, or reactor operator hold certifications in accordance with the requirements of the NSCA.
- 3.2 The licensee shall establish and maintain a training program for certified persons.

#### 4. OPERATING PERFORMANCE

- 4.1 The licensee shall operate the facility subject to the terms and conditions of this licence and within the limits specified in Appendix A to this licence.
- 4.2 The licensee shall maintain an accurate inventory of their sealed sources, both in use and in storage, and provide details of this inventory when requested.
- 4.3 The licensee shall report to the Commission unplanned situations or events at the facility.
- 4.4 The licensee shall submit annual compliance monitoring and operational performance reports to the Commission.

#### 5. SAFETY ANALYSIS

5.1 The licensee shall conduct and maintain safety analyses that are representative for the current hazards of the facility or process analyzed.

#### 6. PHYSICAL DESIGN

6.1 The licensee shall ensure that the defence-in-depth principle is applied and maintained in the design of the nuclear facility in order to prevent, or if prevention fails, to mitigate the consequences resulting from radioactive releases.

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#### 7. FITNESS FOR SERVICE

- 7.1 The licensee shall develop, implement and maintain documented programs of maintenance, testing, surveillance, and inspection of structures, systems and components important to safety to ensure that their availability, reliability and functionality remain in accordance with the design over the lifetime of the facility.
- 7.2 The licensee shall develop, implement and maintain an aging management program for the facility to identify all aging mechanisms relevant to structures, systems and components important to safety; to evaluate their possible consequences; and to provide direction for the activities required to maintain the operability and reliability of these structures, systems and components.

#### 8. RADIATION PROTECTION

8.1 The licensee shall implement and maintain a radiation protection program which includes action levels. When the licensee becomes aware that an action level has been reached, the licensee shall notify the Commission within seven days.

#### 9. CONVENTIONAL HEALTH AND SAFETY

9.1 The licensee shall implement and maintain an occupational health and safety program at the facility.

#### 10. ENVIRONMENTAL PROTECTION

10.1 The licensee shall control, monitor and record releases of radioactive nuclear substances and hazardous substances from the facility.

#### 11. EMERGENCY MANAGEMENT AND FIRE RESPONSE

11.1 The licensee shall implement and maintain an emergency management program to prepare for and respond to emergency events, including fires, initiating at or impacting the facility, and for dealing with the effects of such emergencies both in the facility and outside the facility.

#### 12. WASTE MANAGEMENT

12.1 The licensee shall implement and maintain a waste management program documenting handling, processing, transportation, storage and disposal of nuclear wastes, including nuclear wastes mixed with other hazardous substance.

e-Doc 5899570 (Word) e-Doc 5905832 (PDF)

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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		Doc#:	147-01600-ESDI	R-002	Rev.	0	
Nuclear Project#.	655352 Contract#:		255095	Page.	68 of 201		
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Saskatchewan Research Council	Page 5 of 6
Non-Power Reactor Operating Licence	NPROL-19.01/2023

#### 13. SECURITY

13.1 The licensee shall implement and maintain a nuclear security program to prevent persons from carrying out malevolent actions capable of affecting the safe operation of the facility.

#### 14. SAFEGUARDS AND NON-PROLIFERATION

14.1 The licensee shall implement and maintain safeguards measures required to ensure safeguards implementation at the facility.

#### 15. PACKAGING AND TRANSPORT

15.1 The licensee shall implement and maintain a program for the packaging and transport of nuclear substances.

6 day of December, 2019.

SIGNED at OTTAWA, this

Rumina Velshi, President on behalf of the Canadian Nuclear Safety Commission

e-Doc 5899570 (Word) e-Doc 5905832 (PDF)

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#### APPENDIX A

#### **Operating Limits**

- The licensee shall ensure that the total thermal power from the reactor fuel does not exceed 20 kilowatts under steady-state operating conditions.
- The licensee shall ensure that the maximum excess reactivity of the reactor does not exceed 4.0 mk.
- 3. The licensee shall not operate the reactor at neutron flux levels exceeding 1.05 x 10<sup>12</sup> n cm<sup>-2</sup> s<sup>-1</sup>, except that while increasing power under automatic control a peak power of no more than 1.4 x 10<sup>12</sup> n cm<sup>-2</sup> s<sup>-1</sup> may be permitted for a time of no more than one minute.
- 4. The licensee shall not allow the reactor to contain more than 300 finished SLOWPOKE-2 fuel elements except otherwise approved in writing by the Commission. The total amount of uranium-235 in the reactor shall not exceed 0.95 kg. The fuel elements shall consist of only an uranium-aluminum alloy containing 28% by weight uranium and the uranium enriched to no more than 95% by weight uranium-235.
- The facility may contain sealed sources of uranium-235 for use as testing or calibration devices. The licensee shall ensure that no sealed source contains more than 1.0 grams of uranium-235.

e-Doc 5899570 (Word) e-Doc 5905832 (PDF)

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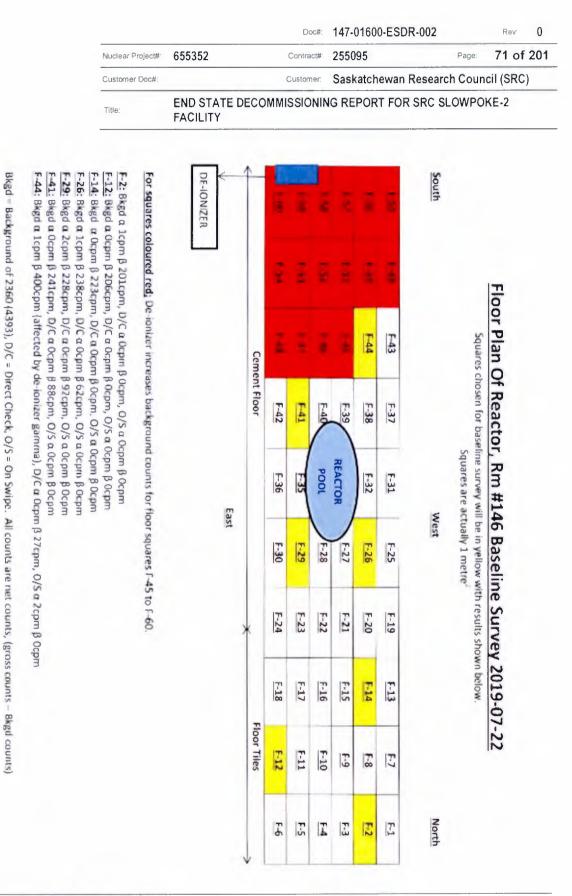
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		Doc#:	147-01600-ESDR-0	02	Rev:	0
Nuclear Project#:	: 655352 Contract#:		255095 Page		70 of 201	
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## Appendix C SUMMARY OF BASELINE RADIOLOGICAL SURVEYS

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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Ludium 2929 Bkgd  $\alpha$  = 1cpm  $\beta$  = 55cpm

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		Doc#:	Doc# 147-01600-ESDR-002		Rev. 0
Nuclear Project#: 655352		ontract#:	Contract#: 255095 P	age:	Page: 72 of 201
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Title.	END STATE DECOMMISS FACILITY	SIONIN	END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 FACILITY	NPOK	E-2

## West Wall Of Reactor Room, Rm #146 Baseline Survey 2019-07-22

Squares chosen for baseline survey will have results printed in the square Squares are 1 metre<sup>2</sup>

South End

North End

www.str	WW 27	(Area 24	WW-21	WW-18	WW-15	WW-12	WW-9	WW-6 <u>Bkgd</u> α Ocpm β 246cpm <u>O/C</u> α Ocpm β Ocpm <u>O/S</u> α Ocpm β Ocpm	WW-3
	WW 10	We pr	<b>WW-2D</b> Bkgd α 1cpm β 244cpm D/C α 2cpm β 61cpm O/S α 0cpm β 0cpm	WW-17	WW-14	WW-11           Bkgd α Jcpm           β 215cpm           D/C α Ocpm           β 60cpm           O/S α Ocpm           β Ucpm	WW-8	WW-5	<b>WW-2</b> <u>Bkgd</u> α Ocpm β 219cpm <u>D/C</u> α Ocpm β Ocpm <u>Ø Ocpm</u>
WW-35	*** 25	ww.37	WW-19	WW-16	WW-13	WW-10	WW-7	WW-4	WW-1

Bkgd = Background of 2360 (4393), D/C = Direct Check, O/S = On Swipe Ludium 2929 8kgd @=Ocpm, B=65cpm

udium zaza ekgo a≈ucpm, p=65cpm

All counts are net counts, (Gross counts - Bkgd counts )

Squares in red, WW-22 to WW-30, are too close to the de-ionizer where the dose rate pushes up the Bkgd too much.

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Cust	omer Doc#:		Customer	Saskatchew	van Research Co	uncil (SRC)
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	7				West	
	NM-T	NW-2		NW-3		North
	NW-4	NW-5 Bkad α Ocpm β 191cpm <u>D/C</u> α 1cpm β 28cpm β 0cpm		NW-6		n Wall Of Read
	NW-7	NW-8		6-MN	Squares a	ctor Room, Rm
	NM-10	NW-11		NW-12	Squares are 1 metre <sup>2</sup>	1 #146 Base will have results
β οςρπ β οςρπ	NW-13 Bkgd u 1cprii 8 pogener	NW-14		NW-15		North Wall Of Reactor Room, Rm #146 Baseline Survey 2019-07-22 Squares chosen for baseline survey will have results printed in the square
	NW-16	NW-17		NW-18		9-07-22

Bkgd = Background of 2360 (4393), D/C = Direct Check, O/S = On Swipe Ludium 2929 Bkgd  $\alpha$ =0cpm,  $\beta$ =65cpm All counts are net counts, (Gross counts – Bkgd counts )

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EW-2

EW-5

EW-8

EW-11

Bigd a 1cpm 5 241cpm D/C a 1cpm

Squares in red, EW-22 to EW-30, are too close to the de-ionizer where the dose rate pushes up the Bkgd too much. All counts are net counts, (Gross counts - Bkgd counts ) Ludium 2929 8kgd a=0cpm, ß=65cpm Bkgd = Background of 2360 (4393), D/C = Direct Check, O/S = On Swipe

Background of 2360 (4393), D/C = Direct Check, O/S = On Swipe

β 33cpm <u>O/5</u> α 0cpm

β Ocpm

0/C a 2cpm

Bkgd a lopm \$ 184cpm

EW-1

EW-4

EW-7

EW-10

EW-13

EW-16

EW-19

0/5 a Ocpm

B Ocpm B Ocpm

 EW-15
 EW-18
 EW-21
 IW 11
 IW 11
 IW 10

 EW-14
 EW-17
 EW-20
 IM 11
 IW 10
 IW 10

 EW-14
 EW-17
 EW-20
 IM 11
 IW 10
 IW 10

 Bkgd a 1cpm
 0 Z33cpm
 D/C a 2cpm
 IW 11
 IW 10
 IW 10

South End

East Wall Of Reactor Room, Rm #146 Baseline Survey 2019-07-22

Squares chosen for baseline survey will have results printed in the square

Squares are 1 metre"

North End

EW-3

EW-6

EW-9

EW-12

Bkgd a Oopm B 201cpm

**D/C** α 1cpm β 68cpm **O/**5 α 2cpm

β Ocpm

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Nuclear Project#:	655352 Contract#		255095	Page:	75 of	201	
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Surveyed by Roger Rees 2019-07-24

## Internal Radiological Survey Of Fumehood (Rm 144)

## Direct Check Using 2360 with 4393 Detector (background β186cpm α 1cpm) Net Counts

- Bottom α 1cpm, β 0cpm
- Right side α lcpm, β 0cpm
- Left side α 1cpm, β 0cpm
- Back α Ocpm, β Ocpm
- Top α Ocpm, β 4cpm
- Vent α 8cpm, β 47cpm
- Inner glass α Ocpm, β Ocpm

# Indirect Check Counted with Ludium 2929 (background β 55cpm α 0cpm Net Counts

- Bottom α 6cpm, β 0cpm
- Right side α 1cpm, β 0cpm
- Left side α 2cpm, β 11cpm
- Back α 2cpm, β 12cpm
- Top α 2cpm, β 10cpm
- Vent α Scpm, β 4cpm
- Inner glass α 1cpm, β 0cpm

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Nuclear Project#:	ect#: 655352 Contract#.		255095	Page	76 of 201		
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#### Surveyed by Roger Rees 2019-07-22 to 2019-07-27

## Survey of Zones 1 and 2

## Zone 1 Rooms 139, 140, 141, 142.1, 142.2, 147 and 147.1

- Bkgd of 4393 α 0cpm β 162cpm, Bkgd of 2929 α 0cpm β 53cpm
- Direct and indirect checks of benches carried out using Ludium instruments 2360 with 4393 and 2929.
- Random spot direct checks carried out of the floor.
- 5M<sup>2</sup> areas of floor surface indirect checked by Masslinn mop.
- Gamma survey carried out at zone boundaries and throughout zone using Bot P-200 with SM305 probe.

#### Results

- Direct checks = Nothing noted above background for α or β
- Indirect checks = Nothing noted above background levels for α or βy
- Masslinn mop of floors = Nothing noted above background levels for a or B
- Random spot checks of floors (direct check) = Nothing above background levels for α or β
- Highest recorded gamma level noted = 0.03mrem/h

## Zone 2 Rooms 143,144,145

- Bkgd of 4393 1 0cpm β 197cpm, Bkgd of 2929 α 0cpm β 47cpm
- Direct and indirect checks of benches carried out using Ludium instruments 2360 with 4393 and 2929.
- Random spot direct checks carried out of the floor.
- 5M<sup>2</sup> areas of floor surface indirect checked by Masslinn mop.
- Gamma survey carried out at zone boundaries and throughout zone using Bot P-200 with SM305 probe

#### Results

- Direct checks = Nothing noted above background for α or β
- Indirect checks = Nothing noted above background levels for α or βγ
- Masslinn mop of floors = Nothing noted above background levels for α or β
- Random spot checks of floors (direct check) = Nothing above background levels for α or β
- Highest recorded gamma level noted = 0.04mrem/h

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Nuclear Project#:	655352	Contract#:	255095	55095 Page:		
Customer Doc#:		Customer:	Saskatchewan R	atchewan Research Council (SRC)		
Title:	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FOR S	SRC SLOWPO	KE-2	

## Appendix D SUMMARY OF END STATE RADIOLOGICAL SURVEYS

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Customer Doc#:		Customer: Saskatchewan Research Council (S				
Title:	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FOR	SRC SLOWPO	KE-2	

## Final Surveys For SLOWPOKE Reactor at Saskatchewan Research Council, Saskatoon

The following tables are the results of the final release surveys carried out following the decommissioning of the SLOWPOKE reactor situated at: 422 Downey Rd, Saskatoon, SK S7N 418, on the campus of the University of Saskatchewan.

#### Reactor Room (Zone 3)

Surveys were done over a period of 2 weeks, 2020-02-24 to 2020-03-06, and incorporated the Reactor Room (room #146) walls, floor, and the empty reactor pool wall and floor. Walls were gridded out in squares of  $1m^2$ , as mandated, and the tables are a direct visual representation of each wall, floor etc. and the squares as they are drawn on the wall. The information inside each square is the final release survey results of that individual square. Crane, manlift and vents above as well as the roof vents have been confirmed free of contamination and radiation.

#### Zone 2 Rooms

The Uranium Analysis Lab (room#143), Gamma Spectroscopy Lab (room#144), and the Sample Storage Room (room#145) were also surveyed for release and the results will be presented in a separate table. These rooms were not mandated to be gridded in the same fashion as Rm #146.

#### Instruments Used

- Fixed Contamination: Ludlum 2360 rate meter using 4293 detector. Detects alpha and beta. Portable hand held instrument.
- Loose Contamination: Ludlum 2929 dual scaler with a 43-10-6 detector. Swipes of areas/items that are suspected of being contaminated are placed in the detector and counted.
- Gamma: Bot P200 meter using a SM 305 low range detector. This is a hand held instrument.

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## Survey Sheet Key

Example of one square:

## Square Number

<u>Bkgd</u> = Result in counts per minute (cpm) of a 1 minute background count of 4393 fixed contamination instrument.

**D/C** = Direct Check . Use 4393 to survey square and perform a one minute count on area of with the highest reading. Record net counts (in cpm). Net counts are the counts left after background is subtracted.

<u>O/S</u> = On Swipe. Result of the swipe used on the square after being counted for 1 minute on the Ludlum 2929. Recorded in cpm (net counts) Swipes area = 100cm<sup>2</sup>

<u>y</u> = Highest gamma reading, 1cm, near contact from surfaces being surveyed. Recorded in millirem per hour (mrem/h).

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## Uranium Analysis Lab (room#143), Gamma Spectroscopy Lab (room#144), and the Sample Storage Room (room#145) Survey Results

- Swipes (100cm<sup>2</sup>) were taken on all surfaces of benches, fumehood (internal and external), cupboards, doors, walls, and floor.
- Direct checks were also performed on these surfaces.
- Gamma, near contact, dose checks were carried out on these surfaces as well as a general field measurement taken.
- Net activity is as follows. Highest D/C = α 2cpm, β 23cpm. Highest swipe counted = α 1cpm, β 9cpm. Highest γ dose rate = 0.02mrem/h. γ general field = background (0.02 to 0.03mrem/h)

## Background Levels During Survey and Swipe Counting

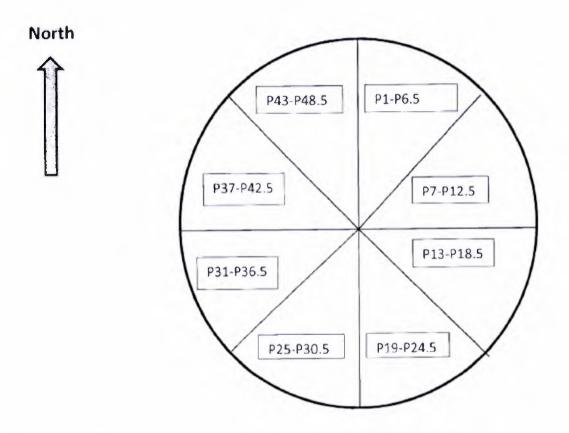
Ludium 2929 - α Ocpm, β 48cpm Ludium 4393 - α 1cpm, β 157cpm Bot P200 - γ 0.00 to 0.04mrem/h

### Surveyor Sign Off

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# Plan View of Reactor Pool Hole:

Segments showing where grid numbers will be located within the Reactor Pool Hole.

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P-28	P-27	P-26	P-25	P-24.5	P-24	P-23	p-22	P-21	P-20	P-19	P-18.5	P-18	P-17	P-16	P-15	P-14	P-13	P-12.5	p-12	P-11	P-10	P-9	P-8	p-7	P-6.5	P-6	P-S	P-4	P-3	p-2	P-1		LOCATION
1	1	0	0	0	0	2	1	0	1	0	0	0	0	0	0	2	0	1	0	0	0	0	1	0	щ	0	1	0	0	0	0	Q	Bkgd
158	153	144	149	161	163	148	149	163	163	167	145	137	146	155	159	164	163	157	157	154	143	145	157	163	169	165	151	169	173	143	165	5	Bkgd (4393)cpm
2	2	1	0	0	0	1	1	2	0	0	ц	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	2	0	0	0	Q	D/C
0	16	0	11	2	0	0	ω	0	0	0	0	0	2	0	0	4	0	1	0	0	0	0	0	14	00	1	12	0	0	9	15	ß	(net)cpm
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	Q	0
0	21	9	0	0	11	5	0	25	6	6	0	19	14	7	4	0	0	1	2	1	1 10	18	6	10	5	0	2	2	21	0	35	β	ols verbbu
0.02	0.01	0.04	0.02	0.02	0.02	0.04	0.01	0.01	0.00	0.03	0.01	0.02	0.01	0.04	0.02	0.02	0.00	0.03	0.01	0.03	0.03	0.04	0.01	0.01	0.02	0.01	0.02	0.04	0.01	0.02	0.00		Contrito Interity

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END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 Title: FACILITY

147-01600-ESDR-002

255095 Contract#:

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Nuclear Project#.

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Saskatchewan Research Council (SRC)

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Location	NG	DAVA (4000)chini	10	of a function			2
	Q	Q	Q	β	R	-	
P-29	0	146	1	4	0	20	0.01
P-30	0	156	1	0	0	4	0.01
P-30.5	0	162	2	2	0	0	0.03
P-31	0	163	0	0	0	1	0.02
P-32	0	137	2	12	0	4	0.04
P-33	0	146	2	9	0	21	0.02
P-34	1	144	0	0	0	15	0.00
P-35	1	152	0	0	0	21	0.01
P-36	0	174	0	21	1	22	0.01
P-36.5	0	166	0	7	1	12	0.04
P-37	2	154	0	0	1	6	0.01
P-38	0	132	0	0	0	7	0.04
P-39	0	158	0	0	0	21	0.02
P-40	0	139	0	7	0	20	0.02
P-41	0	132	0	2	0	5	0.03
P-42	0	149	0	ω	0	19	0.01
P-42.5	0	158	0	2	0	0	0.02
P-43	0	155	1	0	0	9	0.00
P-44	0	146	0	13	0	ω	0.00
P-45	0	163	0	0	1	27	0.02
P-46	0	157	0	0	0	10	0.01
P-47	2	147	0	0	0	13	0.03
P-48	H	165	2	889	0	18	0.02
P-48.5	0	169	0	637	0	0	0.01
P-49	1	167	0	5	0	0	0.00
P-50	1	156	0	1	0	0	0.02
P-51	1	163	0	Þ	0	0	0.01
p-52	0	146	1	0	0	0	0.04

were Beta/Gamma 250 cpm direct check, no loose contamination

Title:

FACILITY

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

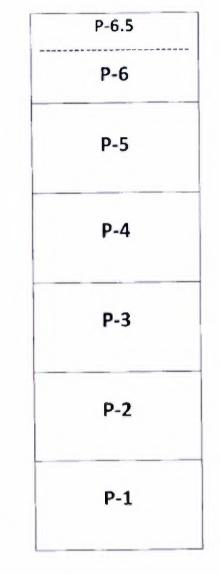
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Nuclear Project#:	655352	Contract#	255095	Page:	84 of 2	201
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# Top of Reactor Pool



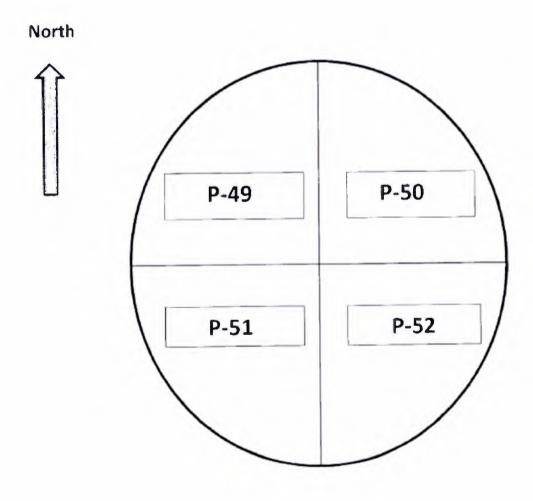
Bottom of Reactor Pool

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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Elevation view of Reactor Pool wall grid pattern



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Title:

FACILITY

	South	F-55	F-56	F-57	F-58	F-59	F-60
		F-49	F-50	F-51	<u>F-52</u>	<u>F-53</u>	F-54
		F-43	F-44	F-45	F-46	F-47	F-48
		F-37	<u>F-38</u>	F-39	F-40	F41	F-42
Squares are 1 m <sup>2</sup>	×	F-31	<u>F-32</u>	REACTOR	POOL	F-35	F-36
m²	West	F-25	F-26	F-27	F-28	F-29	F-30
		F-19	<u>F-20</u>	<u>F-21</u>	<u>F-22</u>	<u>F-23</u>	F-24
		F-13	F-14	F-15	<u>F-16</u>	F-17	F-18
		<u>F7</u>	-8	F-9	<u>F-10</u>	<u>F-11</u>	<u>F-12</u>
	North	E	F-2	F-3	12	5	F-6

East

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

LOCATION	Bkg	Bkgd (4393)cpm	0/0	D/C (net)cpm		O/S (net)cpm	Gamma (net)mrem/h
	Q	β	a	σ	Q	ß	
F-1	0	143	0	2	44	0	0.00
F-2	0	137	0	4	0	2	0.02
F-3	0	153	ىر	0	1	0	0.00
F-4	0	163	0	0	0	5	0.04
F-5	0	155	0	9	0	0	0.04
F-6	<b>5</b> -4	167	0	11	0	ω	0.03
F-7	0	164	0	4	0	6	0.01
F-8	0	145	0	0	1	14	0.02
F-9	0	149	0	0	1	0	0.02
F-10	0	157	0	0	1	80	0.01
F-11	0	157	2	9	0	0	0.03
F-12	0	149	0	15	2	5	0.00
F-13	0	147	0	ω	0	0	0.00
F-14	0	134	0	0	0	2	0.04
F-15	<b>_</b>	144	1	0	0	16	0.01
F-16	1	155	1	0	1	9	0.03
F-17	0	148	0	0	0	0	0.01
F-18	0	166	0	6	2	12	0.01
F-19	0	168	0		0	20	0.02
F-20	0	158	2	7	0	0	0.00
F-21	1	153	1	9	0	9	0.04
F-22	0	169	1	0	0	6	0.04
F-23	2	156	0	0	0	0	0.04
3	>		0	>			0.01

END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 FACILITY

Nuclear Project#:

Customer Doc#

Title.

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Doc#:

Contract#:

Customer:

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255095

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# **Reactor Room #146 Floor Plan and Final Survey Results**

Squares are 1 m

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Saskatchewan Research Council (SRC)

LOCATION	Bkg	Bkgd (4393)cpm α β	α 0/0	D/C (net)cpm		O/S (net)cpm	Gamma (net)mrem/h
5.25	0 8	157 B	2 9	<b>β</b>	0 <b>Q</b>	4β	0
F-26	0	147	0	0	0	4	0
F-27	0	163	0	0	0	1	0
F-28	0	167	0	2	0	0	0
F-29	0	159	0	9	0	4	0
F-30	0	152	0	17	2	ω	0
F-31	0	154	P	8	0	2	0.01
F-32	0	151	0	8	0	6	0.01
F-33	Space at	Space at top of reactor pool					
F-34	Space at	Space at top of reactor					_
F-35	0	162	0	0	0	0	0
F-36	1	142	0	5	0	1	0
F-37	1	158	0	0	0	0	0
F-38	0	144	0	0	0	0	0.04
F-39	0	148	0	80	H.	ω	0
F-40	0	159	1	S	0	0	0
F-41	0	151	ц	ω	0	0	0
F-42	0	155	1	2	1	0	-
F-43	1	157	1	6	1	6	-
F-44	0	147	0	S	0	0	_
F-45	0	149	0	0	0	0	0
F-46	0	141	1	0	0	5	_
	0	139	ц	0	0	1	
F-47						>	

END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2

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FACILITY

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**Reactor Room #146 Floor Plan and Final Survey Results** 

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-	Custon	ner Do	C#:	F	N	) ST	ΓΔΤ	FI	)F(	201	лм	Cus	-	_	-	skatchewan Res				-)
	Title:					ILI														
-			_	- 1	_	_	_	_		- 1	-		_	_	_					
Backeround		F-60	F-59	F-58	F-57	F-56	F-55	F-54	F-53	F-52	F-51	F-50	F-49		LOCATION					
		0	0	0	0	0	0	0	0	0	0	-1	2		-		Rea			
														R	Bkgd (		ictor F			
		157	158	163	162	157	163	172	152	148	160	161	155	ß	(4393)cpm		Room #:			
		0	0	1	1	1	ω	0	0	0	1	0	0	Q	D	Squares	46 Floc			
		0	0	0	0	0	8	ω	00	0	8	0	0	β	D/C (net)cpm	Squares are 1 m <sup>2</sup>	Reactor Room #146 Floor Plan and			
		1	0	0	سر	0	1	0	0	1	0	0	0	R	0		Final			
		0	ω	0	12	0	17	0	0	7	0	0	0	β	O/S (net)cpm		<b>Survey Results</b>			
		0.02	0.02	0.03	0.01	0.03	0.02	0.00	0.01	0.04	0.03	0.03	0.03		Gamma (net)mrem/h		sults			

		)oc#:	Doc#: 147-01600-ESDR-002		Rev 0
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# Reactor Room #146 North Wall Final Survey Results

Squares are 1 m<sup>2</sup>

West

NW-3	NW-6	NW-9	NW-12	NW-15	NW-18
Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a lcpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpm
β 152cpm	ß 145cpm	β 157cpm	β 138cpm	β 132cpm	β 146cpm
D/C a Ocpm	D/C a Ocpm	D/C a 1cpm	D/C a Ocpm	D/C a Ocpm	D/C a Ocpm
β Ocpm	β 4cpm	B Ocpm	B Ocpm	β 9cpm	βOcpm
0/S a 1cpm	O/S a 1cpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a 2cpm
ß Ocpm	ß 14cpm	ß 26cpm	β 9cpm	βOcpm	β 16cpm
y Dose Rate	y Dose Rate				
0.01mrem/h	0.04mrem/h	0.02mrem/h	0.03mrem/h	0.00mrem/h	0.00mrem/h
NW-2	NW-5	NW-8	NW-11	NW-14	NW-17
Bkgd a 2cpm	Bkgd a 1cpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpm
ß 133cpm	β 158cpm	β 165cpm	β 147cpm	β 152cpm	β 149cpm
D/C a Ocpm	D/C a Ocpm	D/C a Ocpm	D/C a 2cpm	D/C a Ocpm	D/C a Ocpm
ß Ocpm	B 17cpm	β Ocpm	βOcpm	β 12cpm	β Ocpm
O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a lcpm	O/S a Ocpm
ß 6cpm	ß 23cpm	β 31cpm	βOcpm	β Ocpm	β 9cpm
y Dose Rate	v Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate
0.01mrem/h	0.02mrem/h	0.01mrem/h	0.03mrem/h	0.03mrem/h	0.04mrem/h
NW-1	NW-4	NW-7	NW-10	NW-13	NW-16
Bkgd a Ocpm	Bkgd a 1cpm	Bkgd a Ocpm	Bkgd a 1cpm	Bkgd a Ocpm	Bkgd a Ocpm
ß 167cpm	β 159cpm	β 151cpm	β 167cpm	β 149cpm	β 141cpm
D/C a Ocpm	D/C a 1cpm	D/C a Ocpm	D/C a Ocpm	<u>D/C</u> α 0cpm	D/C a 1cpm
ß Ocpm	ß Ocpm	ß 21cpm	βOcpm	β Ocpm	β7cpm
O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a lcpm	0/5 a 2cpm
ß Ocpm	ß 11cpm	β12cpm	β Ocpm	βOcpm	β 1cpm
y Dose Rate	y Dose Rate				
0.02mrem/h	0.04mrem/h	0.03mrem/h	0.00mrem/h	0.01mrem/h	0.01mrem/h

### Background

Swipe Counter =  $\alpha$  1cpm,  $\beta$  64cpm Gamma Meter=  $\gamma$  0.00-0.04 mrem/h

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East

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Nuclear Project# 655352		ntract#.	Contract# 255095 Pa	age.	Page: 91 of 201
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Title:	END STATE DECOMMISS FACILITY	NINOI	END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 FACILITY	NPOI	KE-2

# Reactor Room #146 East Wall Final Survey Results

Squares are 1 m<sup>2</sup>

North End

EW-3	EW-6	EW-9	EW-12	EW-15	EW-18	EW-21	EW-24	EW-27	EW-30
Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a 1cpm	Bkgd a Ocpm	8kgd a Ocpm	Bkgd a Ocpm	Bkgd a 1cpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpm
B 167cpm	β 156cpm	β 163cpm	ß 146cpm	β 144cpm	β 149cpm	β 156cpm	β 165cpm	β 145cpm	β 162cpm
D/C a Ocpm	D/C a Ocom	D/C a 2cpm	D/C a Ocpm	D/C a Ocpm	D/C a Ocpm	D/C a 1cpm	D/C a Ocpm	D/C a Ocpm	D/C a Ocpm
ß 15cpm	β 9cpm	ß Ocpm	ß Ocpm	ß 12cpm	ß 1cpm	β 14cpm	β Ocpm	β Ocpm	β Ocpm
O/S a Ocpm	O/S a Ocom	O/S a 1cpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	0/5 a 0cpm	O/S a Ocpm
B Ocom	ß Ocpm	ß Ocpm	B Ocpm	ß Ocpm	ß 19cpm	ß 5cpm	β 4cpm	βOcpm	β 2cpm
v Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate
0.00mrem/h	0.01mrem/h	0.02mrem/h	0.03mrem/h	0.01mrem/h	0.04mrem/h	0.02mrem/h	0.03mrem/h	0.01mrem/h	0.00mrem/h
EW-2	EW-5	EW-8	EW-11	EW-14	EW-17	EW-20	EW-23	EW-26	EW-29
Bkgd a Ocpm	Bkgd a 1cpm	Bkgd a 1cpm	Bkgd a Ocpm	Bkgd a 2cpm	Bkgd a Ocpm	8kgd a 1cpm	Bkgd a 1cpm	Bkgd a Ocpm	Bkgd a Ocpm
β 164cpm	B 149cpm	β 139cpm	B 147cpm	ß 155cpm	6 159cpm	β 149cpm	β 146cpm	β 164cpm	β 158cpm
D/C a lcpm	D/C a Ocpm	D/C a Ocpm	D/C a Ocpm	D/C a Ocpm	D/C a Ocpm	D/C a 1cpm	D/C a lcpm	D/C a 1cpm	D/C α Ocpm
ß Ocpm	ß Ocpm	ß Ocpm	β 4cpm	B Ocom	B Ocpm	ß 2cpm	β Ocpm	β Ocpm	βOcpm
O/S a lcpm	O/S a 1cpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/Sa Ocpm	O/S a Ocpm	O/S a Ocpm
β 6cpm	ß Ocpm	β Ocpm	BOcom	β 8cpm	ß Ocpm	ß Ocpm	ß Ocpm	β 7cpm	β Ocpm
y Dose Rate	v Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate
0.02mrem/h	0.04mrem/h	0.04mrem/h	0.01mrem/h	0.01mrem/h	0.00mrem/h	0.04mrem/h	0.03mrem/h	0.01mrem/h	0.00mrem/h
EW-1	EW-4	EW-7	EW-10	EW-13	EW-16	EW-19	EW-22	EW-25	EW-28
Bkgd a lcpm	8kgd a 0cpm	Bkgd a Ocpm	Bkgd a Ocpm	8kgd a Ocpm	Bkgd a Ocpm	Bkgd a 1cpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpr
ß 157cpm	β 158cpm	β 148cpm	β 162cpm	ß 158cpm	ß 152cpm	ß 161cpm	β 151cpm	β 157cpm	β 167cpm
D/C a Ocpm	D/C a Ocpm	D/C a 1cpm	$D/C \alpha 1 cpm$	D/C a 1cpm	D/C a Ocpm				
β 3cpm	β 6cpm	ß 12cpm	ß 16cpm	ß 4cpm	ß Ocpm	β Ocpm	ß 8cpm	β Scpm	β Scpm
O/S a 1cpm	O/S a Ocpm	O/S a Dcpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a 1cpm	O/Sa Ocpm	O/S a Ocpm	O/S a Ocpm
β 12cpm	β Ocpm	β Ocpm	ß 11cpm	β Ocpm	BOcom	βOcpm	ß Ocpm	β 16cpm	β 0cpm
y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate
0.01mrem/h	0.03mrem/h	0.00mrem/h	0.00mrem/h	0.01mrem/h	0.01mrem/h	0.02mrem/h	0.04mrem/h	0.03mrem/h	0.01mrem/h

### Background

Swipe Counter =  $\alpha$  Ocpm,  $\beta$  64cpm Gamma Meter= y 0.00-0.04mrem/h South End

Reactor	Room #14	6 South V	Vall Final	Survey Results

Squares are 1m<sup>2</sup>

East

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SW-18	SW-15	SW-12	SW-9	SW-6	SW-3
Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a 2cpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpm
ß 163cpm	β 137cpm	ß 146cpm	β 144cpm	β 152cpm	β 174cpm
D/C a Ocpm	D/C a lcpm				
ß 2cpm	β Ocpm	β 7cpm	ß Ocpm	β 12cpm	βOcpm
O/Salcom	O/S a 1cpm	O/S a Ocpm	O/S a Ocpm	O/S a 1cpm	O/S a Ocpm
ß 3cpm	ß 10cpm	β 0cpm	β Ocpm	β 7cpm	β Ocpm
y Dose Rate					
0.02mrem/h	0.03mrem/h	0.01mrem/h	0.02mrem/h	0.04mrem/h	0.01mrem/h
SW-17	SW-14	SW-11	SW-8	SW-5	SW-2
Bkgd a lcpm	Bkgd a Ocpm	Bkgd a 1cpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a 1cpm
β 154cpm	β 132cpm	β 158cpm	β 139cpm	β 132cpm	β 149cpm
D/C a 1cpm	D/C a Ocpm	D/C a Ocpm	D/C a lcpm	D/C a Ocpm	D/C a Ocpm
β 9cpm	β 22cpm	β Ocpm	β Ocpm	β 16cpm	β 14cpm
O/S a Ocpm	0/5 a 1cpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a 1cpm
β Ocpm	βOcpm	β Ocpm	β Ocpm	β 2cpm	βOcpm
y Dose Rate					
0.01mrem/h	0.03mrem/h	0.04mrem/h	0.00mrem/h	0.03mrem/h	0.02mrem/h
SW-16	SW-13	SW-10	SW-7	SW-4	SW-1
Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a 2cpm	Bkgd a Ocpm	Bkgd a Ocpm
B 155cpm	β 146cpm	β 163cpm	β 157cpm	β 147cpm	β 16Scpm
D/C a 2cpm	D/C a Ocpm				
ß 12cpm	β Ocpm	β Ocpm	βOcpm	β 8cpm	βOcpm
O/S a 1cpm	O/S a Ocpm	0/S a 1cpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm
β Ocpm	β 16cpm	β 9cpm	β Ocpm	β Ocpm	βOcpm
y Dose Rate					
0.00mrem/h	0.04mrem/h	0.01mrem/h	0.01mrem/h	0.01mrem/h	0.04mrem/h

### Background

Swipe Counter =  $\alpha$  0cpm,  $\beta$  64cpm Gamma Meter=  $\gamma$  0.00-0.04mrem/h West

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0E-MM	WW-27	WW-24	WW-21	WW-18	WW-15	WW-12	6-MM	WW-6	WW-3
Bkgd a 2cpm	Bkgd a Ocpm	Bkgd a lcpm	Bkgd a Ocpm	Bkgd & Ocpm	Bkgd a Ocpm	Bkgd a lcpm	Bkgd a Ocpm	Bkgd a 1cpm	Bkgd a 2cpm
β 16Scpm	β 143cpm	β 173cpm	β 169cpm	β 151cpm	β 165cpm	β 163cpm	β 157cpm	ß 145cpm	β 143cpm
D/C a lcpm	D/C a Ocpm	D/C a 1cpm	D/C a Ocpm	D/C a 1cpm	D/C a 2cpm	D/C a Ocpm	D/C a lcpm	D/C a 1cpm	D/C a Ocpm
β 14cpm	ß Ocpm	ß Ocpm	ß Ocpm	β 17cpm	β Ocpm	ß Ocpm	ß 2cpm	β Ocpm	β 23cpm
O/S a 2cpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm				
β Ocpm	β Ocpm	β Ocpni	ß Ocpm	ß 4cpm	β Ocpm	β 16cpm	β Ocpm	β Ocpm	\$ Ocpm
y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	<b>y</b> Dose Rate	<b>y</b> Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate
0.01mrem/h	0.00mrem/h	0.01mrem/h	0.31mrem/h	0.01mrem/h	0.03mrem/h	0.00mrem/h	0.01mrem/h	0.04mrem/h	0.02mrem/h
WW-29	WW-26	WW-23	WW-20	WW-17	WW-14	WW-11	WW-8	WW-5	WW-2
Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a 1cpm	Bkgd a 1cpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a lcpm	Bkgd a Ocpm	Bkgd a Ocpm
β 154cpm	β 157cpm	β 163cpm	β 164cpm	β 159cpm	β 155cpm	β 146cpm	β 137cpm	β 167cpm	β 163cpm
D/C a lcpm	D/C a 1 cpm	D/C a 1cpm	D/C a lcpm	D/C a Ocpm	D/C a Ocpm	D/C a Ocpm	D/C a 1cpm	D/C a 1cpm	D/C a 1cpm
β 12cpm	β 3cpm	β 14cpm	β 14cpm	β Ocpm	β Ocprm	β 9cpm	β 11cpm	β Ocpm	ß 14cpm
O/S a 2cpm	0/5 a 0cpm	O/S a Ocpm	O/S a Ocpm	0/5 a 0cpm	O/S a Ocpm	O/S a Ocpm	0/5 a 0cpm	O/S a Ocpm	O/S a Ocpm
ß 11cpm	ß Ocpm	ß Ocpm	β Ocpm	β Ocpm	β Ocpm	β Ocpm	β Ocpm	β Ocpm	ß Ocpm
y Dose Rate	y Dose Rate	y Dose Rate	<b>y</b> Dose Rate	<b>y</b> Dose Rate					
0.02mrem/h	0.02mrem/h	0.02mrem/h	0.00mrem/h	0.01mrem/h	0.01mrem/h	0.01mrem/h	0.04mrem/h	0.01mrem/h	U.U.Smrem/n
WW-28	WW-25	WW-22	WW-19	WW-16	WW-13	WW-10	WW-7	WW-4	WW-1
Bkgd a 2cpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a lcpm	Bkgd a 2cpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpm	Bkgd a Ocpm
β 163cpm	β 149cpm	β 148cpm	β 163cpm	β 149cpm	β 144cpm	β 153cpm	β 1S8cpm	β 146cpm	β 156cpm
D/C a Ocpm	D/C a Ocpm	D/C a Ocpm	D/C a Ocpm	D/C a 1cpm	D/C a Ocpm	D/C a 1cpm	D/C a Ocpm	D/C a Ocpm	D/C a Ocpm
β Ocpm	β 1cpm	β 17cpm	β 8cpm	β 6cpm	β 13cpm	β Acpm	β 1cpm	ß 16cpm	β 4cpm
O/S a lcpm	O/S a Ocpm	O/S a Ocpm	O/S a Ocpm	0/5 a 0cpm	O/S a 1cpm				
β Scpm	β Ocpm	β 1cpm	β Ocpm	β 26cpm	ß Ocpm	ß Ocpm	β 4cpm	β 9cpm	ß 10cpm
,	<b>v</b> Dose Rate	<b>y</b> Dose Rate	<b>y</b> Dose Rate	<b>y</b> Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	y Dose Rate	<b>y</b> Dose Rate
<b>V Dose Rate</b>			Al more to	0.02mrem/h	0 04mrem/h	0 03mrem/h	0.01mrem/h	0.02mrem/h	0.02mrem/h

Gamma Meter= y 0.00-0.04mrem/h

- Proprietary - : This document has been prepared for a member company of the SNC-Lavalin Group. The information contained herein is subject to the terms and conditions of an agreement, which may be referenced on this document. No use, disclosure or reproduction of this document or the information contained herein is permitted, except in accordance with the applicable agreement.

Reactor Room #146 West Wall Final Survey Results

Squares are 1 m<sup>2</sup>

		Doc#:	147-01600-ESDR	Rev:	0	
Nuclear Project#:	655352	Contract#:	255095	Page:	94 of	201
Customer Doc#:		Customer:	Saskatchewan F	lesearch Coun	cil (SRC)	)
Title:	END STATE D FACILITY	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPO	KE-2	

## Appendix E RADIOACTIVE WASTE DATA SHEETS

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

<sup>-</sup> Proprietary - : This document has been prepared for a member company of the SNC-Lavalin Group. The information contained herein is subject to the terms and conditions of an agreement, which may be referenced on this document. No use, disclosure or reproduction of this document or the information contained herein is permitted, except in accordance with the applicable agreement.

			Doc#:	147-01600-ESDR-0	02	Rev: 0
	Nuclear Project#:	655352	Contract#:	255095	Page:	95 of 20
	Customer Doc#:		Customer.	Saskatchewan Res	earch Coun	cil (SRC)
	Title:	END STATE D FACILITY	ECOMMISSIONI	IG REPORT FOR SR	C SLOWPOR	KE-2
NI						
Can Can	adian Nuclear   Laborato oratories   Canadier		Be Cen	tainer		
REQUEST FOR SHIPM	ENT OF RADIOACTIVE MA	TERIAL FORM (439	FORM)		FICIAL USE ONLY Page 1 of 3 508520-STD-003	
		File No.	Doc. Collection ID 5	ubjectIndex Doc. Code	Serial No.	-
Office Use Only I	CD # .			vi Re1≇ ,		
PART 1: SHIPMENT DET		la to be submitted to	the site CNL RAM Shipp	çr.		
Proposed shipment date		ollow later via email	S Known -provide data	2020 02 72		
Description of Item(s)/ Package contents			e-A (8-25) Serial # 16592			
Tritium shipment:	1 No 🖸 Yes - provid	e tritium transfer refe	rence number:			
leason for shipment:	Material to be analyze     Calibration	d 🛛 Waste cispo:		rcial project		
nternational shipment:	⊗ No □ Yes "NQ" - le	ave this section blank.	. "YES" - fill out this sect	ion		
Zaiue în Canadian dollar	s: \$					
uSA shipment: E2 No -E	_ Yes - provide faderal ID#					
The country of origin of i	the item(s): 🗍 Unknown 🗍	details to follow later ov de country	r via email		_	
	∑ No □ Yes Wi □ Collect ⊠ Prepaid	I the material be retur	med to CNL: C No	Ves		
special handling instruct	ions: 🛪 None 🗆 Fragile 🗆	Do not freeze 🗆 Ot	ther - provide Instruction	\$		
o vener gangerous goo	ds – provide description;	Example: Flammabl	e, Corrosive			
ART 2: CONSIGNEE INF	FORMATION (SHIPPING TO)					
Company name	SNC-Lavalin Inc.					
Company address	2251 Speakman Drive, Mis	sissauga, ON, ISK 182	) 	n Birdiriddadau Distantial annadrair Brannad Albara		
company aou ass	1	Provide a	s much information as p	ossible hnical Contact (if applicable)		
ompany avarass		Addition of the local second		In the life in the second life and the second		
	Radluaciive Materia	(Class 7) Shipper	Tec	and content to approace.		
Vame	Radioactive Material	(Class 7) Shipper	Tecl	water content to apparaact		
Vame (elephone number ax number	Radiuaciive Materia	(Class 7) Shipper	Tecl	and all contrasts for solutions (		

			Doc#.	147-01600-ESDR-0	002	Rev (
	Nuclear Project#:	655352	Contract#	255095	Page.	96 of 20
	Customer Doc#.		Customer:	Saskatchewan Re	search Coun	cil (SRC)
	Title:	END STATE DEC FACILITY	OMMISSIONI	NG REPORT FOR SI	RC SLOWPO	KE-2
REQUEST FOR SHIPMENT 900-508520-FM-001 HEV C	)		ORM) Be (	ientainer	OFFICIAL USE O Page 2	
PART 3: PACKAGE INFORMA		1				_
Package description: Typ	e-A (8-25) Serial # 16	592 Package d	mensions:	75" X 50" X 51" (LxWxH)		
C] Unknown		Unkno	NAUL .		_	
Package quantity:		Method o	f transport: 🕅 Read	🗆 Rail 🖾 Air 🗔 Marine		
Unknown			🗖 Unkn	0wn		_
Parkage gross weight: 2,10	00 kg	Carrier na	me:			
Unknown		C Unkna	wn		· · · · · · · · · · · · · · · · · · ·	
Package/item Location		Building:		Rodin.		
NAVARAMINANANANANANANANANANANANANANANANANANAN						_
	TION					_
Fissile material. 🔟 No 🗔 Y Chemical form:	yllium metal issude a s nental (e.g.1-125, Xe-1	ted: □ No ⊠ Yes hielding container made I (33) Oxide Je & UO <sub>2</sub> , U <sub>3</sub> O <sub>8</sub> FFICE USE ONLY – RAM SI	ioni steel ai dilead, ) Other (eig (NH4) <sub>2</sub> N	4004)	<u></u>	19
Fissile material. IS No I Y Chemical form: Radionuclide Inventory: the ra Check one of the following Oi 1. 3 or less radionuclide iden 2. More than 3 radionuclides Unknown radionuclide(s) and	vitium metal institute a s mental (e.g. 1-125, Xe-1 o antionuclide(s) and its PTICINS (iffed Com- identified Attu- activity: A gamma spi-	hielding container made 1 (33) Oxide le g. UO <sub>2</sub> , U <sub>2</sub> O <sub>6</sub> FFICE USE ONLY - RAM SI activity (Bq or Bq/g) shall uplete Table 1 ch a radionuclide invento	nom steel and lead, I Other (e.g. INH4) <sub>5</sub> N HIPPER COMMENTS be Identified prior to ry Est/gamma spec i dentify radionuclide	soft waste bags, There is noO4) a shipping. noluding activities (Leave Ta	ale I blank)	
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Fissile material. MNo Y Kong Kong Kong Kong Kong Kong Kong Kong	vitium metal institute a s mental (e.g. 1-125, Xe-1 o antionuclide(s) and its PTICINS (iffed Com identified Attu activity: A gamina spi the results and then s	hielding container made 1 (33) Oxide (e.g., UO <sub>2</sub> , U <sub>2</sub> O <sub>6</sub> FFICE USE ONLY - RAM SI activity (Bq or Bq/g) shall uplete Table 1 ich a radionuclude invento ec shall be completed to lo hoose Option 1 or 7 depu- ine the results are sent to TABLE 3	nom steel and lead, I Other (e.g. (NH4) <sub>2</sub> N HIPPER COMMENTS the Identified prior to ry fist/gamma spec i dentify radionuclide ending on results the Shipper [] (Lea	soft waste bags, They is noO4) a shipping. Is) and activities (Leave Ta is) and activity. Decide to eff we Table 1 blank)	ale I blank)	125
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Fissile material. MNo Y Chemical form: Radionuclide. Inventory: the ra- Check one of the following OL 1. 3 or less radionuclide iden 2. More than 3 radionuclide (s) Inknown radionuclide(s) and 1. Wait for IL Submit t Radionuclide(s) SEE ATTACHMENT SEE ATTACHMENT SEE ATTACHMENT SEE ATTACHMENT	vitium metal issuite a s mental (e.g. 1-125, Xe-1 o anionuclide(s) and iss PTICINS tifled Com identified Attu activity: A gamma sp the results and then s he 434-form and ensu	hielding container made 1 (33) Oxide (e.g., UO,, U <sub>2</sub> O) FFICE USE ONLY - RAM SI activity (Bq or Bq/g) shall aplete Table 1 ch a radionuclide invento ec shall be completed to (e hoose Option 1 or 7 depu- ine the results are sent to TABLE 3 Activity SEE ATTACHMENT OF plutonium you must fi	Inomisteel and lead, I Other (e.g. INH4),M HIPPER COMMENTS the Identified prior to the Identified prior to the Shipper [] (Ica - provide either "Bit Big Big Big Big Total activ II in the section below	solt waste bags, The shood is a shipping. Including activities (Leave Tailed is) and activity. Decide to effort and is a shipping is a shippi	ble I blank) ther: Ba/g Ba/g Ba/g	<u>x</u>
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900-511300-TMP-011 REV. 2

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#.	147-01600-ESDR-0	02	Rev: 0
Nuclear Project#.	655352	Contract#	255095	Page:	97 of 201
Customer Doc#:		Customer	Saskatchewan Res	search Coun	cil (SRC)
Title	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FOR SF	C SLOWPO	KE-2

REQUEST FOR SHIPMENT OF RADIOACTIVE MATERIAL FORM (434 FORM)

OFFICIAL USE ONLY Page 3 of 3

Note: I	background for	measurements	not to exi	ceed befa/gamma 300 cpm	and alpha 3 cpm	
INNE	R CONTAIN			NTAINERS CHECKED 8 in Levels on:	Y SURVEYOR:	
⊠ Mə		erial in inner con er of containers:		ot shipping container) 🗔 Si	hipping container	
Туре	P	teading (gross)	-	Units	Instrument	nde and serial number
Total beta/gamma (if applicable)		SEE ATTA	HMENT	epm		
Total a pha				cpm		
Removable beta/gamma		Photo: States		cpm/300cm <sup>1</sup> on swipe		
Removable a pha				cpm/300cm <sup>2</sup> on swipe		
□ Ma	torial 🖂 Mate	-	ose rat	tes on: at shipping container) 🕅 Si	hipping container	
Near C	ontact				At 1 Meter	
Béta	Background	rem/h	Beta		Background	renyh
Garruna	15 20	mrem/h	Gam	ma	3.50	mmm/n
Neutron	Background	meen/b	Neut	ron	Background	mren/h

Comments: The Gamma Spot, report is attached for the most significant radionuclides.

Group 1 Radiation Surveyor

in we yes

Canadian Nuclear Laboratories

900-511100-TMP-011 REV. 2

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

			Doc#:	147-01600-E	SDR-002	Rev.
	Nuclear Project#.	655352	Contract#	255095		Page 98 of 2
	Customer Doc#:		Customer:	Saskatchew	an Researcl	h Council (SRC)
	Title:	END STATE D FACILITY	ECOMMISSIONI	NG REPORT F	OR SRC SL	OWPOKE-2
۲ Lab	adian Nuclear   Labora oratories   Canad IENT OF RADIOACTIVE N			U Source		TIAL USE ONLY Page 1 of 3
900 508520-FM-001	REVO			Re	ference: 900-50	
		File Na.:	Dec. Collection ID	Subject Index	Dec. Gode	Serial No.
Office Use Only I	CD #	Notif	lication Given	CNL Ref II		
	This for	rm is to be submitted	to the site CNL RAM SI	hipper.		
PART 1: SHIPMENT DET						
Proposed shipment data Description of item(x)/ Package contents	n: Unknown - details I SRC HEU Source	to follow later via ema	si 🛛 Known -provide	date 2020-02 .	11	
Tritium shipment	🖾 No 🛛 Yes - pro	vide tritium transfer n	eference number			-
Reason for shipment:	Material to be analy     Calibration	vted 🖸 Waste dis 🖹 Other-pro		nmerclal project ray Change Irom SF	IC 10 CNL	
International shipment:	⊠ No □ Yes "NO"	feave this section bia	ink. "YES" - fill out this	sect on		
Value in Canadian dolla:	rs \$					
USA shipment: 🔲 No 🛛	🗆 Yes - provide federal ID#			-		
The country of origin at	the item(s): Unknow	m - details to follow la	ter via email			
	C Known	provide country:				
is the CNL property Will the shipment be:	⊠ No □ Yes □ Collect ⊠ Prepaid	Will the material be re	turned to CNL; 🛛 N	e 🖸 Yes		
	tions: I None I Fragile	Do not freeze	Other – provide Instru	ctions:		
Other dangerous goo	ods – provide description:					_
		Example: Flamm	able, Corrosive			
PART 2: CONSIGNEE IN	FORMATION (SHIPPING TO	וי				
Company name	SNC-Lavalin Inc.					
Company address	2251 Speakman Drive, I	Mississauga, ON, USK :	2.152			
			le as much information			
	Radioactive Male	rial (Class 7) Shipper		Technical Contact	(d applicable)	
Nama						
Name Telepisone number Fax number						

				Doc#:	147-01600-ESDR-002	F	Rev: (
	Nuclear Project#:	655352		Contract#:	255095	Page: 99	) of 20
	Customer Doc#:		(	Customer:	Saskatchewan Resear	ch Council (	SRC)
	Title:	END STAT	E DECOMMI	SSIONIN	IG REPORT FOR SRC S	LOWPOKE-2	2
REQUEST FOR SHIPMEN 200-508520-FM OD1 REV		MATERIAL FOR	M (434 FORM)	HE!	d Shalle OFFI	CIAL USE ONLY Page 2 of 3	
PART 3: PACKAGE INFORM	ATION / DELIVERY INF	ORMATION		_			
	Gai Pall		Package dimension	\$1			
Unknown		1	Unknown				
Package quantity.		1	Method of transpo	rt: (X) Road	Rail C Air C Marine		
Unknown				LI Unkn	own		
ackage gross weight: 2	ke	(	arring nume.				
] ປາ nown		[	Unknown				
Package/ Tem Location:		Building:		-	Room		
PART 4: MATERIAL INFORM	NATION I						
issile material: I No IS		ated. II No K	res. Ph	sical form:	Solid Diliquid Di Gas		
Themical form:	235 Metal	at desire a	-				
El	emental (e.g I-1.25, Xe-						
	c.	DEFICE USE ONLY	- RAM SHIPPER O	JMINENTS			
ladionuclide Inventory the		s activity (Bq ur Bc	a/g) shall be ident?	heo prior tu	shipping.		
theck one of the following (	OPTIONS		a/g) shall be ident	hed prior to	shipping.		
theck one of the following ( 	options: entified Cor	mplete Table 1				slank)	
Theck one of the following ( 1. 3 or less radionuclice ide 1. More than 3 radionuclide	OPTIONS: Intified Corr es identified Cor	mplete Table 1 ach a radionuclide	nventory list/ga	nma spēci	nduding activities (Leave Table 1 b	slank)	
Theck one of the following ( 3 or less radionuclice ide t. More than 3 radionuclide Inknown radionuclide(s) ar	OPTIONS: Intified Corr es identified Cor	mplete Table 1 ach a cadionuclida pec shall be compl	t inventory list/ga	ncia speci dionuclide(		olank)	
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theck one of the following ( . 3 or less radionucilee ide . More than 3 radionucilde Joknown radionucildu(s) an . Watt fo	OPTIONS: entified Corr as identified Att of activity: A gamma up or the results and then	mplete Table 1 ach a cadionuclida per shall be compl choose Option 1	e Inventory list/gar leted to identify ra or 2 depending or e sent to the Shipp TABLE 1	nma spéčii dionactide( i results ier 🗋 (Leài	ncluding activities (Leave Table 1 b s) and activity. Decide to either: ye Table 1 blank)	slank)	
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Check one of the following 6 3 or lins radionuclide ide More than 3 radionuclide Jinknown radionuclide(s) an I. Wait fo II. Submit	OPTIONS: intified Corr es identified Att ad activity: A gamma L sor the results and then the 434-form and ens	mplete Table 1 ach a cadionuclida per shall be compl choose Option 1	e Inventory list/ga leted to identify ra or 2 depending or e sent to the Shipp TABLE 1 Activity – pravida Ba Ba Ba	ncia spéčia dionactide (iresubs er 🗌 (Leð sither *Bq	ncluding activities (Leave Table 1 b s) and activity. Decide to either: re Table 1 blank] " or "Bq/g"	Bq/g Bq/g Bq/g	
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theck one of the following 6 B or less radionuclide ide More than 3 radionuclide Joknown radionuclidu(s) an 1 Wait fo N Submit Radionuclide(s)	OPTIONS: intified Corr as identified Att ad activity: A gamma Ly or the results and then the 434-form and ens Total activity	mplete Table 1 ach a cadionuclida per shall be compl choose Option 1 aure the results an	e Inventory list/ga leted to identify ra or 2 depending or e sent to the Shipp TABLE 1 Activity – pravida Ba Ba Ba Ba	ncai speć i dionacilde( i results er [] (Leà sither ^Bq Total activi ection belo	ncluding activities (Leave Table 1 b s) and activity. Decide to either: ve Table 1 blank) " or "Bq/g"	Bq/g Bq/g Bq/g	
theck one of the following 6 . B or less radionuclide ide . More than 3 radionuclide Jinknown radionuclide(s) an 1. Wait fo N. Submit Radionuclide(s) f the radionuclide(s) are éi Naturel granium	OPTIONS: entified Corr es identified Att ad activity: A gamma up or the results and then the 434-form and ens Total activity ther unanium, thorium kg	mplete Table 1 ach a cadionuclide pee shall be compl choose Option 1 aure the results an	e Inventory list/gar leted to identify ra or 2 depending or a sent to the Shipp TABLE 1 Activity - pravida Ba Ba Ba Ba Ba Copieted or	ncai speć i dionacilde( i results er [] (Leà sither ^Bq Total activi ection belo	ncluding activities (Leave Table 1 b s) and activity. Decide to either: we Table 1 blank) " or "Bq/g" Ty Ny Ny kg	Bq/g Bq/g Bq/g	
(heck one of the following 6 between them 3 radionuclide ide More them 3 radionuclidu(s) an L. Watu fo N. Submit Radionuclide(s) (the radionuclide(s) are ei Natural uranium Natural thorium	OPTIONS: entified Crur es identified Attu- es id	mplete Table 1 ach a cadionuclide pee shall be compl choose Option 1 aure the results an	e Inventory list/gar leted to identify ra or 2 depending or e sent to the Shipp TABLE 1 Activity - pravida Bq Bq Bq bu must fill in the s Oepleted ur Plutonium	ncai speć i dionacilde( i results er [] (Leà sither ^Bq Total activi ection belo	ncluding activities (Leave Table 1 b s) and activity. Decide to either: we Table 1 blank) " or "Bq/g" " ky kg g g	Bq/g Bq/g Bq/g Bq/g	
(heck one of the following 6 between them 3 radionuclide ide More them 3 radionuclidu(s) an L. Watu fo N. Submit Radionuclide(s) (the radionuclide(s) are ei Natural uranium Natural thorium	OPTIONS: intified Crur as identified Attu- activity: A gamma up or the results and then it the 434-form and ens Total activity ther uranium, thorium kg kg 0.01 g	mplete Table 1 ach a cadionuclide pee shall be compl choose Option 1 aure the results an	e Inventory list/gar leted to identify ra or 2 depending or e sent to the Shipp TABLE 1 Activity - pravida Bq Bq Bq bu must fill in the s Oepleted ur Plutonium	ncai speć i dionacilde( i results er [] (Leà sither ^Bq Total activi ection belo	ncluding activities (Leave Table 1 b s) and activity. Decide to either: we Table 1 blank) " or "Bq/g" " ky kg g g	Bq/g Bq/g Bq/g Bq/g	
Check one of the following 6           3 or lins radionuclide ide           More than 3 radionuclide ide           More than 3 radionuclide(s) and           I. Wait fe           II. Submit           Radionuclide(s)           Radionuclide(s)           Ithe radionuclide(s)           Natural uranium           Natural thorium           Enriched uranium	OPTIONS: intified Crur as identified Attu- activity: A gamma up or the results and then it the 434-form and ens Total activity ther uranium, thorium kg kg 0.01 g	mplete Table 1 ach a cadionuclide pee shall be compl choose Option 1 aure the results an	e Inventory list/gar leted to identify ra or 2 depending or e sent to the Shipp TABLE 1 Activity - pravida Bq Bq Bq bu must fill in the s Oepleted ur Plutonium	ncai speć i dionacilde( i results er [] (Leà sither ^Bq Total activi ection belo	ncluding activities (Leave Table 1 b s) and activity. Decide to either: we Table 1 blank) " or "Bq/g" " ky kg g g	Bq/g Bq/g Bq/g Bq/g	
Check one of the following 6           3 or lins radionuclide ide           More than 3 radionuclide ide           More than 3 radionuclide(s) and           I. Wait fe           II. Submit           Radionuclide(s)           Radionuclide(s)           Ithe radionuclide(s)           Natural uranium           Natural thorium           Enriched uranium	OPTIONS: intified Crur as identified Attu- activity: A gamma up or the results and then it the 434-form and ens Total activity ther uranium, thorium kg kg 0.01 g	mplete Table 1 ach a cadionuclide pee shall be compl choose Option 1 aure the results an	e Inventory list/gar leted to identify ra or 2 depending or e sent to the Shipp TABLE 1 Activity - pravida Bq Bq Bq bu must fill in the s Oepleted ur Plutonium	ncai speć i dionacilde( i results er [] (Leà sither ^Bq Total activi ection belo	ncluding activities (Leave Table 1 b s) and activity. Decide to either: we Table 1 blank) " or "Bq/g" " ky kg g g	Bq/g Bq/g Bq/g Bq/g	

900 511300 TMP-013 REV. 2

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDR-002		Rev.	0
Nuclear Project#	655352	Contract#	255095	Page	100 of	201
Customer Doc#:		Cuslomer	Saskatchewan Resea	rch Cour	ncil (SRC	)
Tille	END STATE DE	ECOMMISSIONIN	IG REPORT FOR SRC S	SLOWPC	KE-2	

REQUEST FOR SHIPMENT OF RADIOACTIVE MATERIAL FORM (434 FORM) HEV Source OFFICIAL USE ONLY 900-508520-FM-001 REV 0 Page 3 of 3

Not	el background for	measurements	not to exi	eed beta/gamma 300 com	and atplia 3 cpm	
IN	NER CONTAIN		PING CO	NTAINERS CHECKED B	V SLIDVEVOD-	
	NER CONTAIN				JONVEION	
				n Levels on:		
2				t shipping container). Ef Sh	ipping container	
	Numb	et of container	F			
Түрс	,	leaning (gross)		Units	Instrument n	nodel and serial number
Total beta/gamma (il applicati	e)	Ва	ckground	cpm		
Total alpha			Zero	rpm		
Removable seta/gamma			Zern	cpm/300cm <sup>3</sup> on swipe		
Removable alpha			Zeru	cpm/300cm <sup>3</sup> on swipe		
		l	Dose rat	es on:		
0	Material 🗍 Mate	rial in inner co	ntainer (no	shipping container) 🖾 Sa	ipping container	
Nea	Contact				At 1 Meter	
Beta	Background	rem/ti	Beta		Background	rem/h
Gamma	Background	ratem/h	Gam	ma	Background	mrem/h
	Background	m/em/h	Neut		Backgrowind	meent/h

Comments: The Gamma Spec, report is attached for the most significant radionuclides.

Group 1 Radiation Surveyor

301 VEYO

Canadian Nuclear Laboratories

900-511300-TMP-011 REV. 2

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

			Doc#:	147-01600-ES	DR-002	Rev: 0
	Nuclear Project#:	655352	Contract#:	255095	Paç	ge: 101 of 20
	Customer Doc#:		Customer:	Saskatchewa	n Research Co	ouncil (SRC)
	Title:	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FC	R SRC SLOW	POKE-2
Pi Lab	nadian Nuclear   Labora oratories   Canad			etic "saft- cuelt	OFFICIAL	USE ONLY Page 1 of 3
900-508520-FM-001	REV 0			Refe	erence: 900-50851	-
		File Mo.:	Doc. Collection ID	Subject Index	Dor. Code	Serial No.
Office Use Only	CD #	Notific	ation Given 🖾	CNL Ref #		
	This lo	rm is to be submitted to	the site CNL RAM Sh	lpper.		
PART 1: SHIPMENT DE	TAILS					
Proposed shipment dat Description of item(s)/ Package contents:		to follow later via email actor Components – Ty				-
Tritlum shipment:	🖾 No 👘 Yes - pre	wide tritium transfer ref	erenco number:			
Reason for shipment:	C Material to be anal	yzed 🛛 🕲 Waste dispo 🗋 Other-provi		smercial project		-
Internutional shipment Value in Canadian dolla		- leave this section blan	k, "YES" - fill out this	section		
USA shipment: L3 No The country of origin of		n - details to follow late provide country:	er vils emailt			-
	Collect      Prepaid	Will the material be reti				
	tions. 🛛 None 🕤 Fragile	Bo not freeze     C	other - provide Instruc	tions:		
Other dangerous go	ocs ~ provide description:	Example: Flammal	ale, Cornasive			-
	ITOPAATION RUDDAN C	2)				1
PART 2: CONSIGNEE IN Company name	SNC-Lavalin Inc.	5)				
Company address		Mississauga, ON, LSK 18	2			
		Pravide	as much Information			
	Radioactive Mat	erial (Class 7) Shippler		Technical Contact (i	lapplicable)	
Name Telephone number Far number						
E-mail address						

900-511300-TMP-011 REV. 2

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

			Doc#	147-01600-ESD	R-002 Rev. (
	Nuclear Project#:	655352	Contract#	255095	Page: 102 of 20
	Customer Doc#.		Customer	Saskatchewan I	Research Council (SRC)
	Title.	END STATE DECO FACILITY	OMMISSION	NG REPORT FOR	SRC SLOWPOKE-2
BEQUEST FOR SHIPMEN 900-508520-FM-001 REV		MATERIAL FORM (434 FC		RC+etc.	OFFICIAL USE ONLY Page 2 of 3
PART 3: PACKAGE INFORM	ATION/ DELIVERY INF	DRMATION			
Package description: Ty	pe-A (B-25) Senal # 16	594' Package di	mensions:	75" X 50" X 51" [UKMA]	IJ
C Unknown		Unknow	vn		
Package quantity:		Method of	transport: 🖾 Ilo.	ad 🗆 Rall 🛄 Air 📋 Ma	line
D Unknown			[] Uni	เกอพก	
Package gross weight: 2,	100 kg	Carrier nam	ne:		
Unknown		D Unknow	w <sup>B</sup>		
Package/item Location.		Building		Room:	
PART 4: MATERIAL INFORM	14 TIAN				
Fissilé material: S No Chemical form:	mes i fradia uminum, Plastic, Rubbe	ted: 🗆 No 🖾 Yes er, Steel	Physical for	n: 12 Solid 🗆 Liquid 🗂	Gas
	emental (e.g.) 125, Xe-	33  Oxide (e.g. UO <sub>2</sub> , U <sub>3</sub> O <sub>6</sub>	Other (e.g [NH4),	MpOel	
	٥	FFICE USE ONLY - RAM SHI	IPPER COMMENT	5	
Radionuclide Inventory: the		activity (Bq or Bq/g) shall o	e identified prior	to shipping.	
Check one of the following C		and the state of t			
<ol> <li>3 or tess radionuclide Ide</li> <li>More time 3 codionuclide</li> </ol>		iplete Table 1		tend other with the state	
<ol> <li>More than 3 radionuclide</li> </ol>		ch a racionuci de Inventory			
Unknown radionuciide(s) an				els) and activity. Decide to	) either.
		theose Option 1 or 2 depen the results are sent to the		Aug. Table 1 black!	
1a. 200101	true waw torin and ensu	TABLE 1	ie snipper. Co lice	ave lable 1 plank	
Radionuclide(s)	1		provide either "E	and an life dati	
SEE ATTACHMENT		SEE AFTACHMENT	log	of or pdyg	Pala
ACCESSION OF A DESCRIPTION OF A	1	ass AL (ALTIMER)	0q Dq		Bq/F
			Bq		Ba/s
	Total activity		Hq Total acti	with	Bq/g
If the radionuclide(s) are eit		or plutonium you must fill			Bq/g
🗇 Natura Furanlum	kg		leted uranium	kg	
Natural thefilitm      Eoricfied uranium	kg	C. Plub Wr% U	onlum	£ Wt% U-235 in U	6 U-235
PART 5: INITIA			andla		
		Sr. Branch	CDCE.		
	in the second	131 840		to status making	
			10_		

900-522300-TMP-011 REV 2
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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESD	R-002	Rev:	0
Nuclear Project#:	655352	Contract#:	255095	Page:	103 of	201
Customer Doc#:		Customer:	Saskatchewan	Research Cour	ncil (SRC	)
Title:	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FOR	SRC SLOWPO	OKE-2	

Note: b		N SURVEYOR	Somesell.
TO SEE ST	ckground for measurements not to	exceed beta/gamma 300 cpm	and alpha 3 cpm.
	CONTAINERS OR SHIPPING Contamina erial Di Material in inner container Number of containers:	tion Levels on:	
fype	Heading (gross)	Units	Instrument model and serial number
Tetal beta/gamma (if applicable)	SEE ATTACHME	NT cpm	
rotal alpha		cpin	
Removable beta/gamma		cpm/300cm <sup>2</sup> on swipe	
Removable alpha		opm/300cm <sup>2</sup> on swige	
	erial 🗇 Material In Inner container	And and a second s	
Near Co			At 1 Meter Background rem/h
Beta	Encoded territie	leta	0.04 mieth/h
Garrinii	inter the state of the	iamma	Background mrem/h
Neutron			
	is may be attached to this form und rt is attached for the most significan		sicist.
Group 1 Radiation		4	

900-511300-TMP-011 REV. 2

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

			Doc#:	147-01600-	ESDR-002		Rev 0
	Nuclear Project#:	655352	Contract#	255095		Page	104 of 20
	Customer Doc#		Customer:	Saskatche	wan Researc	h Coun	cil (SRC)
	Title:	END STATE FACILITY	DECOMMISSIONIN	IG REPORT	FOR SRC SL	OWPO	KE-2
	fian Nuclear   Laborato atories   Canadien	ires Nucléaires s	LRC + 1	R tubes	+ Flux	+ Fhe	ine.
REQUEST FOR SHIPMEN	NT OF RADIOACTIVE MA	TERIAL FORM (43)	FORM)		OFFICIA	LUSE ON Page 1 of	
900 508520 FM-001 RE	V 0			Refe	rence: 900-5085	20-STD-0	01
		File No.:	Doc. Callection ID St	bject Index	Dac. Cade	Serial No.	
Office Use Only ICD	H .	Notific	cation Given 🗋 🛛 CN	LRef# .			
	This form	is to be submitted t	o the site CNL RAM Shippe	ar.			
PART 1: SHIPMENT DETAI							7
Proposed shipment date:	Unknown - details to f	ollow lates via email	🕅 Known -provide date	2020-02-22			
Description of item(s)/ Package contents:	SRC SLOWPOKE-2 React	or Components – Ty	pe-A (B-25) Seria # 16593			***	
Fritium shipment.	⊠ No □ Yes · provid	e tritium transfer re	forence number:			-	
Reason for shipment:	Material to be analyzer     Calibration	d 🛛 Waste disp		icial project			
International shipment: 0	S No Li Yes "NO" - lei	eve this section blan	k. "YES" - fill out this secti	on			1
Value In Canadian dollars:							
USA shipment O No 🗇	Yes - provide federal ID#						
The country of origin of the	e tem(s): D Unknown	details to follow late	er via emaif				
	C Known pro						
	No 🗆 Yes Will Collect 🖾 Prepaid	the material be reti	arned to CNL: 🗋 No I	Yes			
Special handling instruction	ns: 🛛 None 🗀 Fragile 🗔 - provide description:	Do not freeze D (	Other - provide Instruction	5.			
		Example: Flammal	ale. Compsive			-	1
PART 2: CONSIGNEE INFO	RMATION INHUBBLIC TOL						1
Company name	SNC-Lavalin Inc.						
Company address	2251 Speakman Drive, Mis:	issauga, ON, LSK 18	2				-
							-
		Provide	as much information as pe	assible			
	Redioactive Material	(Class 7) Shipper	Tech	nical Contact [if	applicable)		
Name							1
felephone number							
Fax number							
- an incompet							

900-511300 TMP 011 RLV. 2

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDR-002		Rev	0
Nuclear Project#:	655352	Contract#	255095	Page:	105 of	201
Customer Doc#:		Customer:	Saskatchewan Resea	rch Cou	ncil (SRC	)
Title	END STATE DI FACILITY	ECOMMISSIONIN	IG REPORT FOR SRC S	SLOWPO	OKE-2	

REQUEST FOR SHIPMENT OF RADIOACTIVE MATERIAL FORM (434 FORM) LRC+IR TUBES OFFICIAL USE ONLY 900-508520-FM-001 REV 0 Page 2 of 3

PART 3: PACKAGE INFORM		84471081				
warden an die materiate and 1			ocioozz	15" Y 50	^ X 51^ (LXWXH)	
	(ype-A (8-25) Sarial # 1659		1510115	13 430	A 31 [LEW WIT]	
Unknown		D Usknown				
Package quantity:		Method of tra			□ Air □ Marine	
CF Unknown				Unknown		
Package gruss weight. 2	2,600 kg	Carrier name:				
Unknown		ET Unknown		-		
Package/item Location:		Building:		Roo	m.	
PART 4: MATERIAL INFOR	MATION		_			
Fissile material: 2 No D	Yes Irradiated	t: 🗆 No 😒 Yes	Physical	torm: 🖾 Safid	🗆 Dejuid 🖾 Gas	
4	uminum, Plastic, Rubber,	Resin				
Chemical form: E	lemental (e.g125, Xe-13)	3) Oxide (a.g. UO <sub>2</sub> , L <sub>3</sub> O <sub>4</sub> ) Ot	ter (e.g. (N	H4];McO <sub>4</sub> }		
	OFF	ICE USE ONLY - RAM SHIPP	ER COMM	ENTS		
		a razionuclide inventory lis shall be completed to ident				
Unknown radionuclide(s) a 1. Wait f	ind activity: A gamma spec for the results and then chr	a radiomaclide inventory lis shall be completed to ident bose Option 1 or 2 dependi the results are sent to the	ify cadions ng on resa	ctide(s) and ac 15	wivity. Decide to eith	
Unknown radionuclide(s) a 1. Wait f	ind activity: A gamma spec for the results and then chr	shall be completed to ident bose Option 1 or 2 dependi the results are sent to the TABLE 1	ify radions ng on resa Shipper IC	clide(s) and ac ts ) (Leave Table	nivity. Decide to eith 1 blank)	
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Unknown radionuclide(s) a (. Wait ( (I. Subm Radionuclide(s) SEE ATTACHMENT See Offician ( ) If the radionuclide(s) are e If the radionuclide(s) are e I Natural uranium I Natural thorium Enriched uranium	Ind activity: A gamma spec for the results and then chr it the 434-form and ensure Spect Supports Total activity sither uranium, thorium or kg kg g	shall be completed to ident base Option 1 or 2 dependit the results are sent to the TABLE 1 Activity – pr SEE ATTACHMENT 2 5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ify radionu ng on resu shipper C ovide eithe iq iq iq iq the section ed uraniud lum	clide(s) and ac its () () cave Table or "Bq" or "Bg activity n below: n	tivity. Decide to eith 1 blank) /s"kg8	er Bq/a Bq/g Bq/g Bq/g

O Canadlan Nuclear Laboratories

900-511100-TMP 011 HLV 2

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDR	2-002	Rev	0
Nuclear Project#:	655352	Contract#:	255095	Page:	106 of	201
Customer Doc#:		Customer.	Saskatchewan R	Research Cour	ncil (SRC	:)
Title:	END STATE DE FACILITY	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPC	KE-2	

	OMPLETED BY	GROUP 1 RADIATION	SURVEYOR		
Note: ba	ekground for	measurements not to e	sceed beta/gamma 300 cpm	and alpha 3 cpm	
	enal 🗆 Mate	Contaminati	ONTAINERS CHECKED E on Levels on: not ahipping container)  SI		
Туре	R	eading (gross)	Units	Instrument r	nodel and serial number
lotal beta/gamma (if applicable)	1	SEE ATTACHMENT	cpm		
Total alpha			cpm		
Removable beta/gamma			cpm/300cm <sup>2</sup> on swipe		
Removable al pha			cpm/300cm <sup>2</sup> on swipe		
- Mate	-		ntes on: not shipping container) 🗟 Sh	hipping container At 1 Meter	
	Backg/ound	rem/h Bes	3	Background	rem/b
Gamma			n/ma		mrem/h
Neutron	Background	mrem/h Neo	utron	Background	
Additional radiological survey result	s may be atta	thes to this form under	the direction of a Health Phy	vsicist.	

900-511300-TMP-011 REV. 2

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

	Nuclear Project#	655352	Contract#.	255095	Page:	107 of	201
	Customer Doc#:		Customer.	Saskatchewan F	Research Cou	ncil (SRC	:)
	Title <sup>,</sup>	END STATE D FACILITY	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPO	OKE-2	_
SFC ASAT HUM	IP III III CAM		nalytical Labora	Di-free	3 6932 F: 306 933 1 800 240 8808	-7922	

www.src.sk.ca/analytical

SRC Group # 2020-1119

Feb 03. 2020

Analytical, SRC 143-111 Research Drive Saskatoon, SK S7N 3R2 Attn: Dave Chorney, 11526

Date Samples Received: Jan-29-2020

Client P.O.:

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 4 authorized by Vicky Snook, Supervisor

\* Test methods and data are validated by the laboratory's Quality Assurance Program.

\* Routine methods follow recognized procedures from sources such as

\* Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF

- \* Environment Canada
- \* US EPA
- \* CANMET

\* The results reported relate only to the test samples as provided by the client.

\* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

\* Additional information is available upon request.

\* Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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											C	)oc#.	147-01600-ESDR-002			Rev:
			Nucle	ar Pro	oject	#	65	5352			Contr	act#.	255095	Pag		108 of 2
			Custo	mer [	Doc#	ł:					Custo		Saskatchewan Researc			
			Title:			_		ID S1 CILI		DEC	OMMISSI	ONIN	G REPORT FOR SRC S	LOW	PO	KE-2
Potassium-40	Zine-85	Manganese-64	Iron-59	Cobalt-80	Cesium-134	Scandium-46	Europium-154	Europium-152	Lab Section 4	Analyte	5758 01/29/2020 SHIM *SOLIDS	Date Samples Received: Jan-29-2020	Analytical, SRC 143-111 Research Drive Saskatoon, SK S7N 3R2 Attn: Dave Chorney, 11526			SCC RESEARCH COURCE
Bajg	Bqig	Balg	Bqig	Bq/g	Bq/g	Balg	Baig	Bqig		Units	"SOLIDS"	29-2020	26			Environme 143-111 Resea
<0.3	2.2	<0.1	<0.4	450	<0.09	<0.2	0.8	9.7		5758		Client P.O.:				Environmental Analytical Laboratories 143-111 Research Drive, Saskatoon, SK. Canada S7N 3R2
													Feb 03, 2020	SRC Grown # 2020-1119	www.src.sk.ca/analytical	Tr. 306-933-6932 Fr. 306-933-7922 Toll-free: 1-800-240-8808 E: analytical資源的: sk.ca

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The temperature of the cooler was 21.9 °C upon receipt.

		Doc#.	147-01600-ESDR-	002	Rev:	0
Nuclear Project#:	655352	Contract#:	255095	Page:	109 of 2	201
Customer Doc#:		Customer.	Saskatchewan Re	esearch Cour	ncil (SRC)	
Title:	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FOR S	RC SLOWPO	OKE-2	

Environmental Analytical Laboratories 143-111 Research Drive, Saskatoon, SK Canada S7N 3F2 E analytical@src.sk.ca

E analytical@src.sk.ca www.src.sk.ca/analytical

SRC Group # 2020-694

Jan 28, 2020

Analytical, SRC 143-111 Research Drive Saskatoon, SK S7N 3R2 Attn: Dave Chorney, 11526

SC MSKATUHEMAN

Date Samples Received: Jan-20-2020

Client P.O .:

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 4 authorized by Vicky Snook, Supervisor

\* Test methods and data are validated by the laboratory's Quality Assurance Program.

\* Routine methods follow recognized procedures from sources such as

\* Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF

- \* Environment Canada
- \* US EPA
- \* CANMET

\* The results reported relate only to the test samples as provided by the client.

\* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

\* Additional information is available upon request.

\* Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

<sup>-</sup> Proprietary - : This document has been prepared for a member company of the SNC-Lavalin Group. The information contained herein is subject to the terms and conditions of an agreement, which may be referenced on this document. No use, disclosure or reproduction of this document or the information contained herein is permitted, except in accordance with the applicable agreement.

				Nucle	ar P	rojec	ct#:	655	352		Contract#:	255095			Page	110 of 2
				Custo	mer	Doc	:#'				Customer;	Saskatchewa	n Res	searc	h Coi	uncil (SRC)
				Title:			_		D STA		SSIONI	NG REPORT FC	OR SF	RC SL	OWF	POKE-2
Potassium-40	Zino-85	Manganese-64	Iron-59	Coban-ou	Cesium-134	Scandum-40	Europium-154	Europium-152	Lab Section 4	Analyte	Date Samples Received: Jan-20-2020	Analytical, SRC 143-111 Research Drive Saskatoon, SK S7N 3R2 Attn: Dave Chorney, 11526				SFC MASKAICHEVONT
Eqig	Baja	Bajg	Bd/g	Biba	6(b)B	Bdg	Bqig	Bubb		Units	0-2020	26				Environme 143-111 Resea
<0.5	7	5.4	11	240		G.4	0.4	3.2		4352	Client P.O.:					Environmental Analytical Laboratories
													Jan 28, 2020	SRC Group # 2020-694	www.src.sk.ca/analytical	T: 306-933-6932 F: 306-933-7922 Toll-free: 1-800-240-8808 E: analytical@sec.sk.ca

The temperature of the cooler was 24.2 °C upon receipt

	Nuclear Project#:	655352	Contract#:	255095		Page:	111 of	201
	Customer Doc#:		Customer	Saskatch	ewan Research	Cour	ncil (SRC	:)
	Title:	END STATE D FACILITY	ECOMMISSIONI	IG REPOR	T FOR SRC SLC	OWPC	OKE-2	
SCC LASCATURE			Analytical Labo		T: 305 933-6932 F: Tol-free: 1-800-240		33-7922	

aboratories Tol-free: 1-600-240-8808 143-111 Research Drive, Saskatoon, SK. Canada S7N 3R2 E analytical/@src.sk.ca

www.src.sk.ca/analytical

SRC Group # 2020-483

Jan 21. 2020

Analytical, SRC 143-111 Research Drive Saskatoon SK S7N 3R2 Attn: Dave Chorney, 11526

Date Samples Received: Jan-14-2020

Client P.O .:

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 4 authorized by Vicky Snook, Supervisor

\* Test methods and data are validated by the laboratory's Quality Assurance Program.

\* Routine methods follow recognized procedures from sources such as

\* Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF

- \* Environment Canada
- \* US EPA
- \* CANMET

\* The results reported relate only to the test samples as provided by the client.

\* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

\* Additional information is available upon request.

\* Where applicable, unless otherwise noted. Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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107 10 711	II (SRC)	E.2	SCC SASA				I Analytical Laboratories nve, Saskatoon, SK Canada S7N 3R2	T: 306-933-6932 F: 306-933-7922 Toll-free: 1-800-240-8808 E: analytical@src.sk.ca
i	unci	<b>OK</b>						www.src.sk.ca/analytical
Page:	1 Co	SLOWPOKE-2						SRC Group # 2020-483
	arc	SL						- Jan 21, 2020
255095	Saskatchewan Research Council (SRC)	DECOMMISSIONING REPORT FOR SRC			1			
		NG	Sample #:	2020003534			Client PO #:	
Contract#	Customer.	MISSION	Date Sampled: Sample Matrix: Description:	Jan 10, 2020 METAL 01/10/2020 IRR/	ADIATION	TUBE	Date Received:	Jan 14, 2020
		IMOC	Analyte		Units	Result	DL	
		DEC	Lab Section 4					
		END STATE FACILITY	Europium-15	2	Ba/g	0.04	0.01	
655352		END STA1 FACILITY	Europium-154		Bolg	0.03	0.009	
22		ACA	Scandium-46		Bolg	0.08	0.02	
9		шш	Cesium-134		Bq/g	<0.01	0.01	
ect#:	oc#:		Cobalt-60		Bq/g	2.8	900.0	
Nuclear Project#:	Customer Doc#		Iron-59		Bq/g	<0.03	0.03	
lole	Istor	Title:	Manganese-6	4	Bq/g	0.11	0.02	
ź	õ		Zinc-65		Bq/g	10	0.04	
			Potassium-40	)	Balg	0.09	0.05	

Gamma spectroscopy detection limits are influenced by several factors. "Less than" values reported above represent the lowest detection limits achievable for the sample.

The temperature of the cooler was 21.4 °C upon receipt.

		Doc#	147-01600-ESDR	002	Rev:	0
Nuclear Project#:	655352	Contract#:	255095	Page:	113 of	201
Customer Doc#:		Customer.	Saskatchewan R	esearch Cou	ncil (SRC	)
Title.	END STATE DE FACILITY	ECOMMISSIONIN	IG REPORT FOR S	RC SLOWPO	DKE-2	

SIC SAEKATORENAN

RUSH

Environmental Analytical Laboratories T: 306-933-6932 F: 306-933-7922 143-111 Research Drive, Saskatoon, SK. Canada S7N 3R2

Tol-free: 1-800-240-8808 E: analytical@src.sk.ca

www.src.sk.ca/analytical

SRC Group # 2020-1703

Feb 13, 2020

Analytical, SRC 143-111 Research Drive Saskatoon, SK S7N 3R2 Attn: Dave Chomey, 11526

Date Samples Received: Feb-12-2020

Client P.O.:

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 4 authorized by Vicky Snook. Supervisor

\* Test methods and data are validated by the laboratory's Quality Assurance Program.

\* Routine methods follow recognized procedures from sources such as

\* Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF

- \* Environment Canada
- \* US EPA
- \* CANMET

\* The results reported relate only to the test samples as provided by the client.

\* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

\* Additional information is available upon request.

\* Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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Nuclear Project#	655352	Contract#:	255095	Page:	114 of 201
Customer Doc#:		Customer:	Saskatchewan I	Research Cour	ncil (SRC)
Title:	END STATE DE	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPO	KE-2

SIC SASKATCHEMAN

**RUSH** 

Environmental Analytical Laboratories Tal 143-111 Research Drive, Sestatoon, SK Canada S7N 3R2 E:

T. 306-933-6932 F: 306-933-7922 Toll-free: 1-800-240-8808 E: analytical@src.sk.ca

www.src.sk.ca/analytical

SRC Group # 2020-1703

Feb 13, 2020

Analytical, SRC 143-111 Research Drive Saskatoon, SK S7N 3R2 Attn: Dave Chorney, 11526

Date Samples Received: Feb-12-2020

Client P.O .:

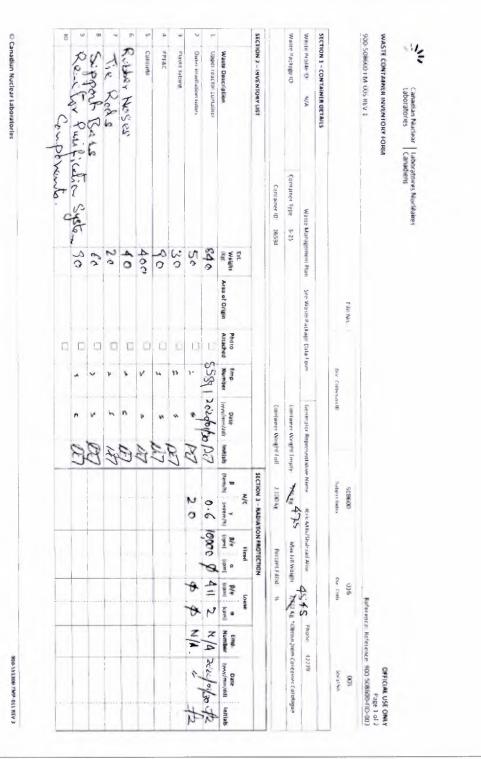
8221	02/12/2020 CHIPS OF C3 REACTOR POOL *CONCRETE*	
8222	02/12/2020 RESIN FROM RM 145 "RESIN"	

Analyte	Units	8221	8222	
Lab Section 4				
Europium-152	Bayg	0.64	<0.02	
Europium-154	Bqig	<0.008	0.05	
Scandium-46	Bạig	0.04	<0.009	
Cesium-134	Bayg	0.04	<0.007	
Cesium-137	Bợg	0.02	70	
Cobalt-60	Bqig	0.43	0.02	
Iron-59	Bqig	<0.02	⊲0.01	
Manganese-64	Bajg	0.0B	<0.007	
Zinc-85	Bqig	<0.03	<0.01	
Potassium-40	Baig	0.5	<0.04	

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDF	R-002	Rev:	0
Nuclear Project#:	655352	Contract#.	255095	Page:	115 of	201
Customer Doc#:	****	Customer	Saskatchewan F	Research Cour	ncil (SRC	)
Title:	END STATE D	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPC	DKE-2	



-	Nucl	ear P	rojec	ct#	65	655352 Contract#:							:#:	255095 Page: 11					
_	Cust	omer	Doc	#:	Customer:								er;	Saskatchewan Research Council (SRC					
_	Title						ST A		DE	COMN	IIS	SIO	NIN	GF	REF	POF	RT	FOR SRC SLOWPOKE-2	
50	5		~	15	'n	2	1	2			SECT		1000	APM P	SIC			900	
		Restr	Contrast folly screar or	Motal Arms	Wrad atton tubes	filled shelded cuntainer	Eyániei A3	Eylinder #2	Jun Lathaner	Waste Description	SECTION 2 - INVENTORY LIST		Waste Pathage D:	Wanter Fridder 10	SECTION 1 - CONTAINER DETAILS			Canadian Nuclear   1 Laboratores   1 WASTE CONTAINER INVENTORY FORM	
			ste		23	s cuntainer			lun Lechange from water purchastant system	Rhon	TORY LIST			12/A	UNER DETAILS			Canadian Nuclean Laboratories ER INVENTORY FO	
									Attended and									itabe Canal RY FORM	
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-		20	0.0	20	30	1800	40	4 ?	40	ie) in the		3		Water frantagement Pass					
						h.				Ares of Origin				See Maryle 6	and the second se		tie No		
u			۵	C			0	0	D	Photo		i		See Waste Paskage Data Form			3	Ì	
		*	٣	٣.	2		r		15853	(mp. Number			-	E Qu Frit		He Cale of D			
		n	•	a	11	11	P	-	SSRS1 20200130	(WW)mm(d)		Container	Chintalver	Generativ		940			
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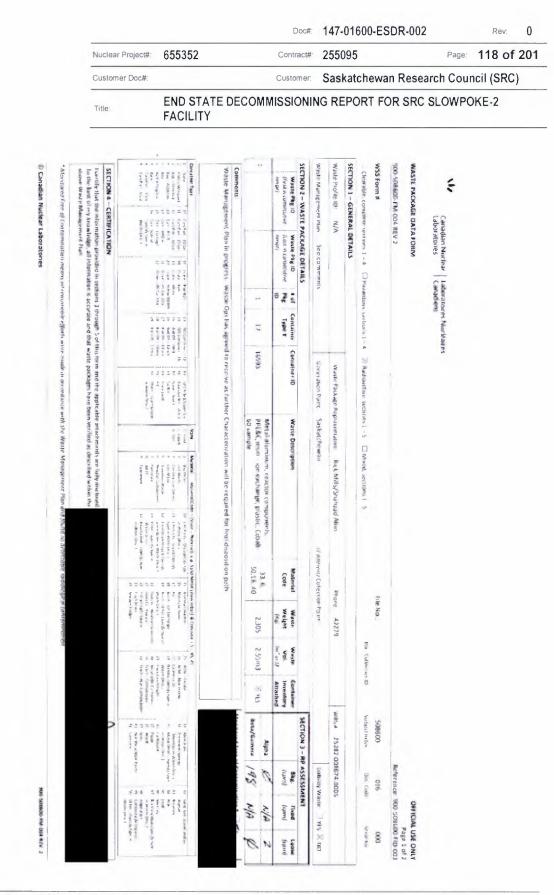
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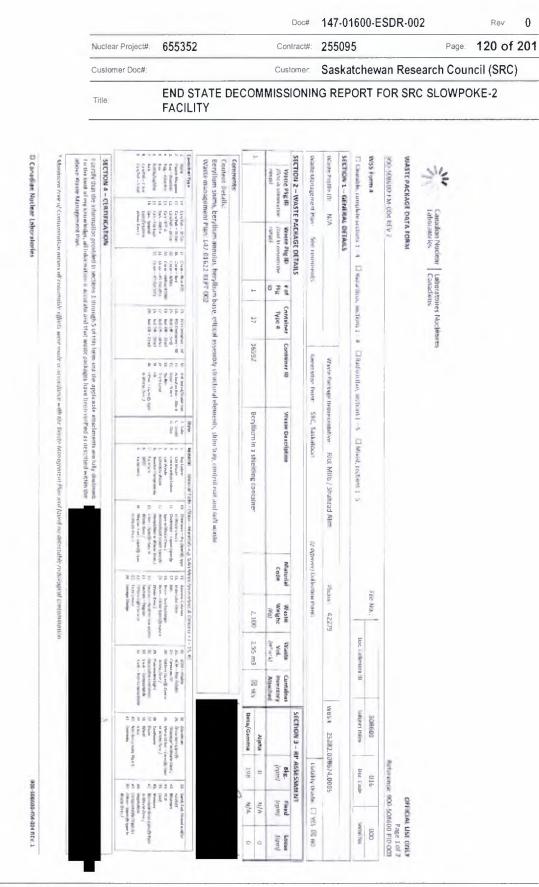
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		Doc#:	147-01600-ESD	R-002	Rev.	0
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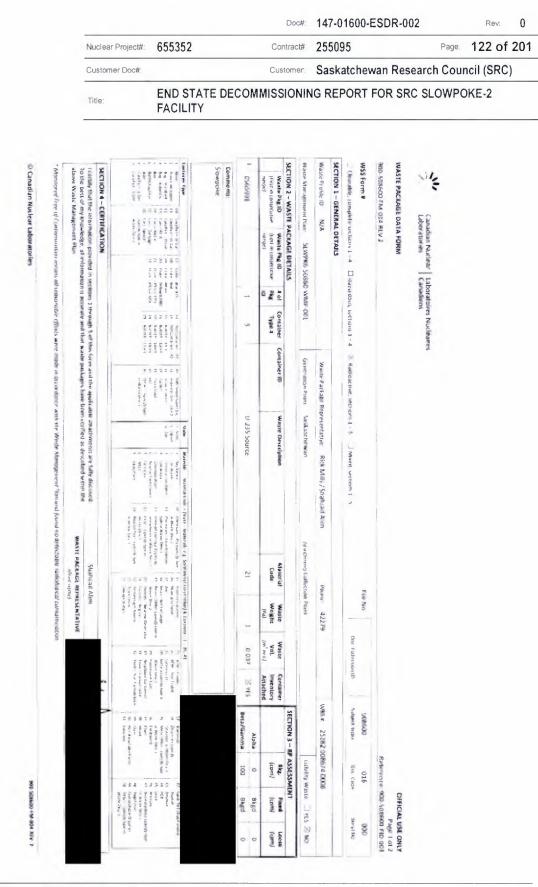
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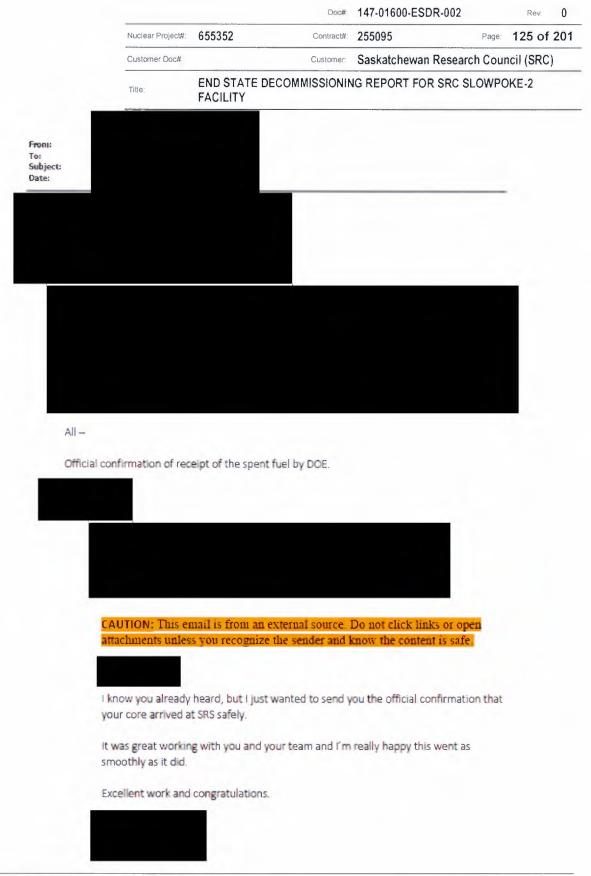
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# Appendix F IRRADIATED FUEL BILL OF LADING AND RECEIPT OF DELIVERY

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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Office of Nuclear Material Removal National Nuclear Security Administration P.O. Box A Aiken, SC 29802-0900 (803) 952-7639 ofc (240) 388-5438 cell

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# Appendix G POOL WATER SAMPLE DATA & APPROVALS

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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		Doc#.	147-01600-ESDI	R-002	Rev:	0
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Community Standards/Community Services vww.saskatoon.ca 222 Third Ave N tel (306) 657.8766 Saskatoon SK S7K 0J5

Saskatchewan Research Council 422 Downey Rd Saskatoon SK S7N 2X8

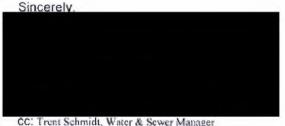
# Re: Saskatchewan Research Council - Special Discharge Permit Application

I acknowledge receipt of your Special Discharge Permit Application received on January 10, 2020. Having reviewed the information provided, we have determined to issue a conditional permit to discharge into the City sanitary system.

In addition to the terms and conditions attached to this letter, conditions of the permit are as follows:

- Discharge into the sanitary system should be discontinued in the event any radionuclide in the reactor pool water is above the limit permitted by SRC's Canadian Nuclear Safety Commission amended licence.
- SRC is responsible for making sure that the sanitary system inside the University of Saskatchewan is able to handle the proposed flow rate indicated in their application.

Please be advised that a permit to discharge is hereby granted until February 28, 2020.



Terry Freimark, Operations Superintendent Terry Erns, Claims and Technical Operations Supervisor Mike Sadowski, Acting Plant Manager Sudhir Pandey, Environmental Laboratory Coordinator

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDR	-002	Rev:	0
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Title.	END STATE DI FACILITY	ECOMMISSIONIN	IG REPORT FOR S	SRC SLOWPC	KE-2	



# Terms and Conditions Related to the Application

- The applicant agrees to provide such additional information the City may require to consider this permit application.
- The applicant must obtain written right-of-way permission to cross all private land and access private infrastructure.
- 3. The applicant must obtain site specific traffic control authorization to cross any City owned street with hoses or to temporarily block traffic.
- 4. Without limiting any other right, remedy or enforcement power under Sewer Use Bylaw No. 9466, if the applicant makes any false, misleading or inaccurate representations in this application, as determined by the General Manager, the General Manager may reject this application or cancel or terminate any Permit or Agreement arising from this application. It is an offence to make any false, misleading or inaccurate representations in this application.

# **Conditions Which Attach to All Permits**

- The applicant must agree to accept and abide by the Terms and Conditions identified in the permit and the permit approval letter;
- The applicant must agree to assume all responsibility and liability whatsoever in respect to any fees, interest, costs, expenses, damage or loss, arising directly or indirectly from the issuance of this permit.
- The applicant must at all times, retain a copy of the permit at the location specified in the address indicated in this application.
- Issuance of a permit is specific to the conditions listed and shall in no way be construed or be deemed to be a broad approval, authorization or acceptance of any discharge to the City's sanitary sewage system.
- The applicant understands authorization to discharge to the City's sanitary sewer system shall occur and take effect only to the extent stated in a fully and validly executed permit.
- The applicant is responsible for ensuring discharge into the sanitary sewer system will not cause an adverse effect.
- 11. The applicant must notify the City immediately of any spill, breach of condition, or expansion or alteration to process which may impact the conditions stated within the permit.
- 12. The applicant must not add, cause or permit the addition of any matter to sewage for the purpose of dilution to achieve compliance with any limits specified by the City.
- 13. The applicant is responsible for ensuring the discharge pursuant to issuance of a permit meets all applicable legislation and the operation is conducted in a safe manner. Issuance of a permit does not relieve duties to comply with any other law, including public health legislation, environmental protection legislation, and any other bylaw of the City.
- An Environmental Protection Officer or other personnel authorized under the Sanitary Sewer Bylaw No. 9466 may inspect any property for the purpose of ensuring compliance with the Conditions associated with an issued permit.

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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Canadian Nuclear Safety Commission

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Directorate of Nuclear Cycle and Facilities Regulation

> File No.: 4.03.02 e-Doc: 6097275

Telephone: 613-992-3870 E-mail: ismail.erdebil@canada.ca

January 20, 2020

Mr. Philip Rees Facilities Manager & CSO, Organizational Effectiveness Saskatchewan Research Council 125-15 Innovation Blvd, Saskatchewan, Saskatoon SK S7N 2X8

# Subject: Saskatchewan Research Council (SRC) Pool Water Analyses

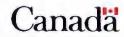
Dear Mr. Rees,

Canadian Nuclear Safety Commission (CNSC) staff reviewed [1] Saskatchewan Research Council's (SRC) analyses of radionuclides in the SRC SLOWPOKE-2 Reactor pool (SRC pool) water [2 & 3], and compared them against the conditional clearance levels in appendix R of CNSC REGDOC-1.6.1 [4], as well as the exposure-based release limit derived using the methodology in CSA N288.1-14 [5]. Furthermore, assuming that the activity of the radionuclide is equal to the detection limit, the activities would still be below the conservative conditional clearance levels.

CNSC staff also reviewed the results of the hazardous substances and compared them against the limits in schedule "B" of the City of Saskatoon's sewer use bylaw [6].

CNSC staff conclude that releasing the pool water to the sewer does not present unreasonable risk and can be discharged to the sewer. CNSC staff note that SRC would still need to obtain the required permissions from the City of Saskatoon.

280 Stater Street, Post Office Box 1046, Station B Otawa, Ontario K1P 5S9 Canada Fax 613-995-5086 nuclearsately gc ca



280 rue Slater, Case postale 1048, Succursale B Ottawa (Ontario) K1P SS9 Canada Telecopieur : 613-995-5086sumtenucleare pc ca

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

Nuclear Project#.	655352	Contract#.	255095	Page:	132 of 201
Customer Doc#:		Customer	Saskatchewan F	Research Cou	ncil (SRC)
Title:	END STATE DE FACILITY	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPO	DKE-2

Mr. Philip Rees -2- January 20, 2020

Should you require further information or clarification, please do not hesitate to contact the undersigned.

Sincerely,

Ismail Erdebil Senior Project Officer Canadian Nuclear Safety Commission Nuclear Processing Facilities Division

c.c.:

- D. Chomey (SRC)
  - A. Shahzad (CANDU Energy)
  - C. Ducros, P. Tanguay, S. Eaton, J. Lam, K. Sauvé (CNSC)

# **References:**

- Memo, J. Lam to P. Tanguay, HSECD memo on the results of the SRC Pool Water Analysis. January 16, 2020. (e-Doc: 6096576)
- Saskatchewan Research Council (SRC). SRC Pool Water Analysis results Performed by an Independent Lab. (e-Doc: 6091871)
- Saskatchewan Research Council (SRC), SRC Pool Water Analysis results Performed by SRC's lab (e-Doc: 6093584)
- Canadian Nuclear Safety Commission (CNSC). REGDOC-1.6.1: Licence Application Guide: Nuclear Substances and Radiation Devices (<u>https://nuclearsafety.gc.ca/eng/acts-and-</u>regulations/regulatory-documents/published/html/regdoc1-6-1/index.cfm)
- CSA Group. CSA N288.1-14 Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities
- City of Saskatoon. Bylaw No. 9466 The Sewer Use Bylaw, 2017 (https://www.saskatoon.ca/sites/default/files/documents/city-clerk/bylaws/9466.pdf)

e-Doc 6097275

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDF	8-002	Rev:	0
Nuclear Project#:	655352	Contract#:	255095	Page:	133 of	201
Customer Doc#:		Customer:	Saskatchewan F	Research Cour	ncil (SRC	)
Title	END STATE D FACILITY	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPC	OKE-2	



Your Project #: 11526 Your C.O.C. #: 1021665

#### Attention: KEITH GIPMAN

Saskatchewam Research Council 143 - 111 Research Drive Saskatoon, SK CANADA S7N 3R2

> Report Date: 2020/01/07 Report #: R2831217 Version: 1 - Final

# CERTIFICATE OF ANALYSIS

#### 8V LABS 108 #: 89A8342 Received: 2019/12/17, 14:08 Sample Matrix: Water # Samples Received: 1

		Date	Oate		
Analyses	Quantity	Extracted	Analyzed	Laboratory Method	Analytical Method
Biochemical Oxygen Demand	1	2019/12/19	2019/12/24	AB SOP-00017	SM 23 52108 m
Cadmium - low level CCME (Total)	1	N/A	2019/12/20		Auto Calc
Chloride/Sulphate by Auto Colourimetry	1	N/A	2019/12/24	AB 50P-00020 / AB 50P- 00018	SM23-4500-CI/SO4-E m
COD by Colorimeter	1	N/A	2019/12/21	AB 50 P-00016	5M 23 52200 m
Sulphide (as H2S)	1	N/A	2019/12/23		Auto Calc
Mercury (Total) by CV [1]	1	2019/12/23	2019/12/23	88Y750P-00015	BCMOE BCLM Oct2013 m
Elements by ICP - Total	1	2019/12/19	2019/12/20	AB SOP-00014 / AB SOP- 00042	EPA 6010d R4 m
Elements by ICPMS - Total	1	2019/12/19	2019/12/19	AB 50P-00014 / AB 50P- 00043	EPA 60206 R2 m
Oil and Grease by IR	1	2019/12/19	2019/12/20	CAL SOP-00096	SM 23 5520C m
Benzo(s) pyrene Equivalency (4)	1	N/A	2019/12/20		Auto Calc
PAH in Water by GC/MS	1	2019/12/19	2019/12/20	AB 50P-00037 / AB 50P- 00003	EPA 3510C/\$27DE m
Total LMW, HMW, Total PAH Cale	1	N/A	2019/12/20		Auto Calc
Phenols (1-4AP)	1	N/A	2019/12/23	AB 50 P-00008	EPA 9066 R0 m
Total Sulphice	1	N/A	2019/12/23	AB 50 P-00050	SM 23 4500 S2-A D Fm
Cyanice (Total) Low level	1	2019/12/19	2019/12/19	CAL 50P-00270	SM 23 4500-CN m
Total Tribalomethanes Calculation	1	N/A	2019/12/23		Auto Calc
Total Kjeldahl Nitrogen	1	2019/12/27	2019/12/27	AB 50 P-00008	EPA 351.1 R1978 m
Total Phosphorus	1	2019/12/27	2019/12/27	AB 50 P-00024	5M 23 4500-P A.B.F m
Hydrocarbon by IR (Mineral oil & grease)	1	2019/12/19	2019/12/20	CAL SOP-00095	SM 23 5520C.F m
Total Suspended Solids (NFR)	1	2019/12/24	2019/12/24	AB 507-00061	SM 23 2540 D m
VOCs in Water by HS GC/MS (Std List)	1	N/A	2019/12/21	AB 50 P-00056	EPA 5021a/3260d m
Total Nonylphenol in Liquids by HPLC (2)	1	2019/12/27	2019/12/28	CAM 50 P-00313	In-house Method
Nony phenol Ethoxylates in Liquids: HPLC (2)	1	2019/12/27	2019/12/25	CAM 50P-00313	Maxxam Method
Artificial Isotope Group Analysis (3)	1	N/A	2019/12/27	BQL 50P-00007	Garmma Spectrometry
NORM Group Analysis (3)	1	N/A	2020/01/01	BQL 50 P-00007	Gamma Spectrometry

#### Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise nated, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

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hyres, Vertas Laboratorias Calgory: 2021 - 454 Avenue N.E. 120 072 [Feliphone (403) 216-3037 [Feli (403) 236-9488

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#	147-01600-ESDR-0	02	Rev:	0
Nuclear Project#	655352	Contract#:	255095	Page	134 of	201
Customer Doc#:		Customer	Saskatchewan Re	search Coui	ncil (SRC)	)
Title.	END STATE DI FACILITY	ECOMMISSIONIN	IG REPORT FOR SI	RC SLOWPO	OKE-2	



Your Project #: 115.06 TOUL C.D.C.F. MUSIEES

#### Attention: KETTH G PMAN

Sestetchewen Research Council 143 - 111 Research Drive Saukatoon, SK CANADA 57N 382

> Report Date: BIZU/OL/CU Report 4: K2831227 Version: 1 - I mail

## CERTIFICATE OF ANALYSIS

BY LARS JUB & EDARGAZ Received: 2019/12/17, 14:08

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in 84 Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Lats in writing). All data is in statistical control and has met quality control and method performance oriteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted. Measurement Uncertainty has not been eccounted for when stating conformity to the referenced standard.

89 Labs liability is limited to the actual test of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Ellent using the texting methodology referenced in this report. Interpretation and use of text results are the sole responsibility of the Client and are not within the scope of services provided by 89 Late, unless otherwise agreed in writing. BY Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except blets, are based on dry weight unless otherwise indicated. Organic analyses are not recovery connected except for horizon dilutiog methods.

Besuits relate to samples tested. When sampling is not conducted by BV Leis, results relate to the supplied samples tested.

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Reference Method suffs "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs associated using new data. The rounding of Rhail results may result in the apparent difference.

111 This see: was performed by TV Labs Vanchuver

[3] This test was performed by EV Labs Genarie (From Calgary)

(3) This test was performed by IN Labs (Error Calgary) (4) Else? TPC is calculated using UC of the FDL for non-detect results as per Alberta Environment instructions. This personal may not apply in other jurisdictions.





orne Velates Lamountary -----

Please direct all cuestions regarding this Centificate of Analysis to your Project Manager. Curtomet Solutions, Western Canada Curtomet Sperience Team Email: clatomenolis/innovent@bylabs.com

Phone# (403) 291-3077

This report has been generated and distributed using a secure automated process.

IN Late has procedures in place to guard against improper use of the electronic signature and have the required "signaturies", as per ISD/IEC 17025, signing the reports. For Service Group specific validation please entering the Validation Signature Page.

#### Total Cover Pages : 3 Page 3 of 23

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDR	8-002	Rev:	0
Nuclear Project#:	655352	Contract#.	255095	Page:	135 of	201
Customer Doc#:		Customer	Saskatchewan F	Research Cour	ncil (SRC	)
		COMMISSION			NE 2	

END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 Title<sup>.</sup> FACILITY

# THE REAL 8V Labs Job #: BBAB342 Report Date: 2020/01/07

#### Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

# PAH IN WATER BY GC/MS (WATER)

BV Labs ID		XD4197	1	
Sampling Date		2019/12/17		
COC Number		M081665		
	UNITS	SLOWPOKE POOL	RDL	QC Betd
Polycyclic Aromatics				
Low Molecular Weight PAH's	ug/L	<b>d</b> .20	0.20	9714110
High Molecular Weight PAH's	ug/L	-0.050	0.050	971411
Tetal PAH	ug/L	-0.20	0.20	971411
8[3]P TPE Total Potency Equivalents	ug/L	-0.010	0.010	9713651
Acenaphthene	ug/L	-0.10	0.10	971454
Aces aphthylene	ug/L	-0.10	0.10	9714646
Acridine	ug/L	-0.040	0.040	9714644
Anthracene	ug/L	-0.010	0.010	9714644
Benzo(a)anthracene	ug/L	<0.0085	0.0065	9714546
Benzo(b&j)fuoranthene	ug/L	<0.0085	0.0065	9714646
Benzo(k)fluoranthene	ug/L	<0.0085	0.0065	9714546
Benzo(g,h,i)perylene	ug/L	<0.0085	0.0065	9714646
Benzo(c)phemanthrene	ug/L	-0.050	0.050	9714646
Benzo(a)pyrene	ug/L	<0.0075	0.0075	97145-4
Senzo(e)pyrene	ug/L	-0.050	0.050	9714646
Chrysene	ug/L	<0.0085	0.0065	9714646
Disenz(a,h)anthracene	ug/L	<0.0075	0.0075	9714646
Fluoranthene	ug/L	-0.010	0.010	971454
Fluorene	ug/L	-0.050	0.050	9714546
Indeno(1.2.3-cd)pyrene	ug/L	<0.0085	0.0065	9714646
2-Methylnaphthaiene	ug/L	-0.10	0.10	9714546
2-Methylnaphthaiene	ug/L	-0.10	0.10	9714646
Naphthalene	ug/L	-0.10	0.10	9714646
Phenanthrerie	ug/L	-0.050	0.050	9714646
Pesylene	ug/L	-0.050	0.050	9714646
Pyrene	ug/L	-0.020	0.020	9714646
Quinoline	ug/L	-0.20	0.20	9714646
Surrogate Recovery (%)			•	
D10-ANTHRACENE (sur.)	%	101		9714646
DB-ACENAPHTHYLENE (sur.)	%	97		9714646
DS-NAPHTHALENE [sur.]	*	\$2		9714546
TERPHENVL-D14 (sur.)	5	123		9714646

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Burnes Vertas laboratories Calgory: 2021-4 lat Avenue N.C. 725 972 Telephone (#23) 291-3077 Tele (#02) 231-3468

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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Nuclear Project#.	655352	Contract#:	255095	Page:	136 of 201
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Tille: END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 FACILITY

# EV Labs Job #: 89A8342 Report Date: 2020/01/07

Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

# REGULATED METALS (CCME/AT1) - TOTAL

8V Labs ID		XD4197		
Sampling Date		2019/12/17		
COC Number		M081665		
	UNITS	SLOWPOKE POOL	RDL	QC Batch
Low Level Elements				
Total Cadmium (Cd)	ug/L	-0.020	0.020	9712892
Elements				
Total Aluminum (Al)	mg/L	0.0049	0.0030	9713453
Total Antimony (Sb)	mg/L	-0.00060	0.00060	9713453
Total Arsenic (As)	mg/L	-0.00020	0.00020	9713053
Total Barium (Ba)	mg/L	-0.010	0.010	9713860
Total Beryllium (Be)	mg/L	-0.0010	0.0010	9713053
Total Boron (B)	mg/L	-0.020	0.020	9713860
Total Calcium (Ca)	mg/L	-:0.30	0.30	9713060
Total Chromium (Cr)	mg/l	-0.0010	0.0010	9713053
Total Cosalt (Co)	mg/L	<0.00030	0.00030	9713053
Total Cosper (Cu)	mg/L	+0.00020	0.00020	9713053
Total Iron (Fe)	mg/L	-0.060	0.060	9713860
Total Lead (Pb)	mg/L	0.00031	0.00020	9713853
Total Lithium (Li)	mg/L	-0.020	0.020	9713060
Total Magnesium (Mg)	mg/L	+:D.20	0.20	9713860
Total Manganese (Mn)	mg/L	0.0040	0.0040	9713860
Total Molybdenum (Mo)	mg/L	+0.00020	0.00020	9713053
Total Nickel (Ni)	mg/L	-0.00050	0.00050	9713053
Total Phosphorus (P)	mg/L	:0.10	0.10	9713060
Total Potassium (K)	mg/L	-D.30	0.30	9713860
Total Selenium (Se)	mg/L	0.00063	0.00020	9713-053
Total Silicon (Si)	mg/L	d0.10	0.10	9713-060
Total Silver (Ag)	mg/L	0.00012	0.00010	9713853
Total Socium (Na)	mg/L	-:0.50	0.50	9713560
Total Strontium (Sr)	mg/L	-0.020	0.020	9713860
Total Sulphur (S)	mg/L	0.43	0.20	9713060
Total Thallium (Ti)	mg/L	+0.00020	0.00020	9713153
Total Tin (Sn)	mg/L	-0.0010	0.0010	9713053
Total Titanium (Ti)	mg/L	-0.0010	0.0010	9713-853
Total Uranium (U)	mg/L	-:0.00010	0.00010	9713853
Total Vanadium (V)	mg/L	-0.0010	0.0010	9713053
Total Zinc (Zn)	mg/L	-0.0030	0.0030	9713053

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDF	8-002	Rev:	0
Nuclear Project#	655352	Contract#	255095	Page:	137 of	201
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Title:	END STATE DI FACILITY	ECOMMISSIONIN	G REPORT FOR	SRC SLOWPO	OKE-2	

BV Labs Job #: E945342 Report Date: 2020/01/07

### Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

#### **RESULTS OF CHEMICAL ANALYSES OF WATER**

BV Labs ID		XD4197		
Sampling Date		2019/12/17		
COC Number		MD81665		
	UNITS	SLOWPOKE POOL	RDL	QC Batch
Calculated Parameters				
Sulphide (as H25)	mg/L	-0.0020	0.0020	9713020
Demand Parameters				
Biochemical Oxygen Demand	mg/L	<2.0 (1)	2.0	9714645
Chemical Oxygen Demand	mg/L	<10	10	9717834
Misc. Inorganics				
Strong Acid Dissoc. Cyanide (CN)	mg/L	-0.0020	0.0020	9708137
Total Suspended Solids	mg/L	<1.0	1.0	9719561
Anions				
Total Sulphide	mg/L	<0.0018	0.0018	9718621
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	9719690
Nutrients				
Total Phosphorus (P)	mg/L	-0.0030	0.0030	9721399
Total Total Kjeldahl Nitrogen	mg/L	<0.050	0.050	9721299
Mise. Organics				
Oil and grease	mg/L	<2.0	2.0	9712320
Phenols	mg/L	-0.0015	0.0015	9716453
Total Petroleum Hydrocarbon	mg/L	<2.0	2.0	9713990
RADIONUCLIDE				
Cesium-134	Bq/I	d	1	9727685
Cesium-137	Bq/I	4	1	9727605
Cobalt-60	Bq/I	d	1	9727685
lodine-131	Eq/I	<1	1	9727685
Manganese-54	Bc/I	4	1	9727685
Radium 226	Bc/I	<1.0	1.0	9727686
Uranium-235	Bg/I	+:0.50	0.50	9727686
Zinc-65	Bc/l	d	1	9727685

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

Nuclear Project#: 655352 Contract#: 255095 Page: 138 of 20	Nuclear Project#;	000002	Contract#	200090	Page:	138 01	201
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#### END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 Title: FACILITY



Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

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NONYL PHENOL AND NONYL PHENOL ETHOXYLATE (WATER)

BV Labs ID		XD4197		
Sampling Date		2019/12/17		
COC Number		M081665		
	UNITS	SLOWPOKE POOL	RDL	QC Batch
MISCELLANEOUS				
Nonylphenol Ethoxylate (Total)	mg/L	«0.02.5	0.025	9723115
Phenols				
Nonyiphenol (Total)	mg/L	<0.0010	0.0010	9723114
RDL = Reportable Detection Lim			0.0010	212.322

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDR-0	02	Rev:	0
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Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

MERCURY BY COLD VAPOR (WATER)

Total Mercury (Hg)	ug/L	<0.0020	0.0020	9718156
Elements				
	UNITS	SLOWPOKE POOL	RDL	QC Batch
COC Number		M021665		
Sampling Date		2019/12/17		
8V Labs ID		XD4197		

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

Doc#:	147.	01600-	ESDR-002	2
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# END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 FACILITY

# BV Labs Job #: B9A0342 Report Date: 2020/01/07

Title

Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

# VOLATILE ORGANICS BY GC-MS (WATER)

BV Labs ID		XD4197		
Sempling Date		2019/12/17		
COC Number		10001665		
	UNITS	SLOWPOKE POOL	RDL	QC Batch
Volatiles				
Total Trihalomethanes	ug/L	<1.3	1.3	9714011
Benzene	ug/L	<0.40	0.40	9716741
Bromodichloromethane	ug/L	-:0.50	0.50	9716741
Bromoterm	ug/L	<0.50	0.50	9716743
Bromomethane	ug/L	<2.0	2.0	971674
Carbon tetrachloride	ug/L	<0.50	0.50	9716741
Chlorobenzene	ug/L	×0.50	0.50	9716741
Chlorodibromomethane	ug/L	<1.0	1.0	9716741
Chloroethane	ug/L	<1.0	1.0	971674
Chloroform	ug/L	<0.50	0.50	9716741
Chloromethane	ug/L	<2.0	2.0	9716741
1,2-dibromoethane	ug/L	<0.20	0.20	9716741
1,2-dichloroberzene	ug/L	<0.50	0.50	9716741
1,3-clich loroberzene	ug/L	<0.50	0.50	9716741
1,4-dichlorobenzene	ug/L	<0.50	0.50	971674
1,1-clichloroethane	ug/L	<0.50	0.50	9716741
1,2-dichloroethane	ug/L	<0.50	0.50	9716741
1,1-dichloroethene	ug/L	<0.50	0.50	9716741
cis-1,2-dichloroethene	ug/L	⊲0.50	0.50	9716741
trans-1,2-dichloroethene	ug/L	<0.50	0.50	9716743
Dichloromethane	ug/L	<2.0	2.0	9716741
1,2-dichloropropane	ug/L	⊲0.50	0.50	9716741
cis-1.3-dichloropropene	ug/L	⊲0.50	0.50	9716741
trans-1,3-cichloropropene	ug/L	<0.50	0.50	9716741
Ethylbensene	ug/L	<0.40	0.40	9716743
Methyl methacry late	ug/L	×0.50	0.50	9716741
Methyl-tere-busylether (MTBE)	ug/L	-:0.50	0.50	9716741
Styrene	ug/L	<0.50	0.50	971674
1,1,1,2-tetrachloroethane	ug/L	<1.0	1.0	9716741
1,1,2,2-tetrachloroethane	ug/L	<2.0	2.0	9716741
Tetrachloroeshene	ug/L	<0.50	0.50	9716741
Toluene	ug/L	<0.40	0.40	9716741
1.2.3-trichlorobenzene	"5/L	<1.0	1.0	9716741

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#	147-01600-ESDF	R-002	Rev	0
Nuclear Project#:	655352	Contract#:	255095	Page.	141 o	f 201
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Title:	END STATE D	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPC	KE-2	

FACILITY

# () BV Labs Job #: B9A0342 Report Date: 2020/01/07

Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

# VOLATILE ORGANICS BY GC-MS (WATER)

BV Labs ID		XD4197		_
Sampling Date		2019/12/17		
COC Number		N1081665		
	UNITS	SLOWPOKE POOL	RDL	QC Batch
1,2,4-trichlorobenzene	ug/L	<1.0	10	9716741
1,3,5-trichlorobenzene	ug/L	<0_50	0.50	9716741
1,1,1-trichloroethane	ug/L	<0.50	0.50	9716741
1,12-trichloroethane	ug/L	<0.50	0.50	9716741
Trichloroethene	ug/L	<0.50	0.50	9716741
Trichlorofluoromethane	ug/L	<0.50	0.50	9716741
1,2,4-trimethylbenzene	ug/L	<0.50	0.50	9715741
1,3,5-trimethylbenzene	ug/L	<0.50	0.50	9716741
Vinyl chloride	ug/L	<:0.50	0.50	9716741
Xylenes (Total)	ug/L	<0.00	0.80	9716741
m & p-Xylene	us/L	<d.s0< td=""><td>0.00</td><td>9716741</td></d.s0<>	0.00	9716741
o-Xylene	ug/L	<0.40	0.40	9716741
Surrogate Recovery (%)				-
1.4-Difluorobenzene (sur.)	*	39		9716741
4-Bromofluorobenzene (sur.)	%	948		9716741
D4-1.2-Dichloroethane (sur.)	%	100		9716741

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

			Doc#:	147-01600-ESDR-002	Rev. 0
	Nuclear Project#:	655352	Contract#	255095	Page: 142 of 201
	Customer Doc#		Customer	Saskatchewan Researc	h Council (SRC)
	Title:	END STATE D FACILITY	ECOMMISSIONIN	IG REPORT FOR SRC SI	LOWPOKE-2
0					
BV Labs Job #: B9AD				Saskatchewan Research Cou	ncil
Report Date: 2020/	01/07			Client Project #: 11526 Sampler Initials: DC	
			GENERAL COMM	IENTS	
Each temperate	ure is the average of	up to three cooler terr	peratures taken at recei	pt	
Packa	ge 1 17.0*(	5			

Results relate only to the items tested.

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#.	147-01600-ESDR-00	2	Rev:	0
Nuclear Project#:	655352	Contract#:	255095	Page:	143 of	201
Customer Doc#:		Cuslomer:	Customer. Saskatchewan Research Cou			
Title.	END STATE D	ECOMMISSIONIN	IG REPORT FOR SR	C SLOWPO	OKE-2	

FACILITY



Report Date: 2020/01/07

Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

# QUALITY ASSURANCE REPORT

QA/QC Satch	sin	QCType	Parameter	Date Analyzed	Value	Recovery	UNITS	ac Limit
9708137	TMU	Matrix Spile	Strong Acid Distor. Crenite (CN)	2019/12/19	wayur.	NC	3	80 - 120
703137	TMU	Spiked Blank	Strong Acid Diszos. Cyanide (CN)	2019/12/19		101	5	ED - 120
705137	TMU	Method Blank	Strong Acid Dissoc. Cyanice (CN)	2019/12/19	<0.0020	- 191 L	mg/L	6.9 - 4.64
708137	TMU	RED DE DIEN	Strong Acid Dissoc. Cyanize (CN)	2013/12/19	18		3	20
9712329	110	Matrix Spile (004197-19)	Oil and grease	2019/12/20	10	57	5	70 - 133
9712329	LLO	Spiked Blank	Dil and grease	2019/12/20		95	3	70-130
9712328		1				29		10-130
9713973	ELD PC3	Method Blank Matrix Spike	Oil and grease	2013/12/20 2015/12/29	<2.0	205	mg/L	80-120
24123333	FQ	SHICE XIDEM	Total Aluminum (Al)					
			Total Antimony [30]	1019/12/19		:20	5	E0-120
			Total Arsenic [As]	2019/12/19		101	5	80-120
			Total Bery lium (Be)	1015/12/19				80 - 120
			Total Chromium (Cr)	2019/12/19		104	5	80-120
			Total Coosit (Co)	2019/12/19		103	5	80-120
			Total Copper Cu	2019/12/19		NC	5	80-120
			Total Lead (Fo)	2019/12/19		107	5	80 - 120
			Total Molybdenum [Mo]	2019/12/19		109	5	80-120
			Total flickel (Ni)	2019/12/19		102	5	80 - 120
			Total Selenium (Se)	2019/12/19		100	5	E0 - 12/2
			Total Silver (Ag)	2013/12/19		2014	5	80-120
			Total Thellium [TI]	2019/12/19		108	5	80-120
			Total Tin [3n]	2019/12/19		113	3	20 · 120
			Total Titanium (Ti)	2019/12/19		101	3	80 - 120
			Total Uranium (U)	2019/12/19		205	3	ED - 120
			Total Vanadium (V)	2019/12/19		105	3	20 - 120
			Total Zinc (Zn)	2019/12/19		115	5	20-120
9713823	PC5	Spiked Biank	Total Aluminum (Al)	2019/12/19		10/9	5	20 - 120
			Total Antimony [So]	2015/12/19		126 (1)	5	80 - 120
			Total Arsenic (As)	2019/12/19		2.20	3	80 - 120
			Total Berytlium (Be)	2019/12/19		92	3	EID - 120
			Total Chromium (Cr)	2019/12/19		10/9	3	80 - 120
			Total Cosat (Ca)	2019/12/19		110	5	80 - 120
			Total Copper (Cu)	2019/12/19		110	5	80-120
			Total Lead (FD)	2019/12/19		113	3	ED - 120
			Total Melybdenum (Mo)	2019/12/19		113	3	80 - 120
			Total Nickel [N]	2019/12/19		108	5	80-120
			Total Selenium (Se)	2019/12/19		:03	5	80 - 120
			Total Silver (Ag)	2019/12/19		2.9.4	3	ED - 120
			Total Thallium (TI)	2019/12/19		24.4	5	50 - 130
			Total Tin (Sn)	2019/12/19		119	35	80 · 120
			Total Titanium (Ti)	2019/12/19		109	3	80-120
			[U] muinerU leseT	2019/12/19		107	35	80 - 120
			Total vanatium (V)	2019/12/19			3	80 - 120
			Total Zinc (Zn)	2019/12/19		103	3	20 - 120
9715923	PC5	Method Blank	Total Aluminum (Al)	2019/12/20	-0.0030		mg/L	
			Total Antimony (So)	2015/12/20	CO DOCIER		mg/L	
			Total Arsenic [As]	2019/12/20	<0 0002B		mg/L	
			Total Bendlium (Be)	2319/12/20	0.0010		mg/L	
			Total Chromium (Cr)	2019/12/20	<0.0010		mg/L	
			Total Copatt (Cs)	2019/12/20	0 00030		mg/L	
				2019/12/20	+0.00020			
			Total Cooper (Cu)	2019/12/20	-0.00020		mg/L	
			Total Lets (Fo)	2013/12/20	<0.00020		mg/L	
			Total Malybdenum (Mo)				mg/L	
			Total Nickel [N]	2019/12/20	-0.00050		mg/L	
			Total Selenium (Se)	2013/12/20	0.00020		mg/L	

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#	147-01600-ESD	२-002	Rev:	0
Nuclear Project#:	655352	Contract#:	255095	Page;	144 of	201
Customer Doc#:		Customer.	Saskatchewan I	Research Cour	ncil (SRC	)
Title	END STATE D	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPO	OKE-2	

FACILITY



8945342 2020/01/07 Saskatchewan Research Council Client Project # 11526 Sampler Initials: DC

# QUALITY ASSURANCE REPORT(CONT'D)

Satch	Init	QC Type	Ferameter	Date Analyzed	Value	Recovery	UNITS	Q.C.Limit
Server!			Total Silver (Ac)	2015/12/20	-0.00010		mg/L	a watty
			Total Thailium (TI)	2015/12/20	0.00020		mg/L	
			Total Tin (Sn)	2019/12/20	-0.0010		mg/L	
			Total Titanium [7]	2015/12/20	+0.0010		mg/L	
			Total Uranium (U)	2019/12/20	-0.00010		me/L	
			Total Vanadium (V)	2015/12/20	0.0010		mg/L	
			Total Zinc (Zn)	2019/12/20	0.0050		-	
13935	PCS	RFC	Total Aluminum (Al)	2015/12/19	NC		mg/L	20
212233	-0	RE			17			20
			Total Antimony (20) Total Arsenic (As)	2015/12/19 2015/12/19			19	20
			Total Eerstiium (Se)	2015/12/19	6.4 NC			20
							*	
			Total Chromium (Cr)	2013/12/19	NC NC		3	2.0
			Total Cobalt (CD)	2013/12/15			5	2.0
			Total Copper (Cu)	2015/12/19	0.65			20
			Total Lead (Po)	2015/12/19	192		h	2.0
			Total Molybdenum (Mo)	2019/12/19	12		36	20
			Total Nickel (N.)	2019/12/19	1.2		16	20
			Total Selenium (Se)	2015/12/19	3.8		25	20
			Total Silver (Ag)	2019/12/19	4.6		23	2.0
			Total Thallium (TI)	2013/12/19	NC		2.3	20
			Total Tin (Sn)	2019/12/19	NC		3	20
			Total Titanium (Ti)	2019/12/15	NC		35	2.0
			Total Uranium (U)	2015/12/19	0.3		25	20
			Total Vanadium (V)	2015/12/19	NC		33	2.0
			Total Zinc (Zn)	2015/12/19	15		25	20
9713960	NCAP	Matrix Spike	Total Barium (Ba)	2019/12/20		5-5	25	80 - 120
			Total Boron (E)	2019/12/20		95	25	20 - 120
			Total Calcium (Ca)	2019/12/20		NC	*5	20 - 120
			Total Iron (Fe)	2015/12/20		101	3	20 - 120
			Total Lithium (L)	2015/12/20		95	35	80 - 120
			Total Magnesium [Mg]	2019/12/20		101	3	20 - 120
			Total Manganese (Mn)	2013/12/20		93	5	\$D · 120
			Total Photohorus (P)	2013/12/20		98	-	80 - 12
			Total Potassium (K)	2019/12/20		96	5	80 · 120
			Total Silicon (Si)	2019/12/20		105	3	50 - 120
			Total Sodium (Na)	2019/12/20		NC	3	80-12
			Total Strontium (Er)	2015/12/20		5.2	35	20 · 120
			Total Sulphur [5]	2019/12/20		52	35	80-120
9713860		Sp. ed Blan	Total Earlum (Ea)	2013/12/20		59	5	80 - 120
9-19900	THAT .	she co state	Total Boran (B)	2019/12/20		57	*	20 - 12
			Total Calcium (Ca)	2019/12/20		102	5	80 - 120
			Total Iron (Fe)	2019/12/20		104	3	80-120
			Total Lithium (Li)	2015/12/20		97	*	20-12
				2019/12/20		103		20-120
			Total Magnesium (Mg)				3	
			Total Manganese (Min)	2013/12/20		98		80-120
			Totel Phosphorus (P)	2019/12/20		58	*	20-120
			Total Fotessium [K]	2015/12/20		97	76	80-120
			Total Silican (Si)	2019/12/20		109	5	20-120
			Total Socium (Na)	2015/12/20		53	3	80-120
			Total Strontium (Sr)	2019/12/20		97	*5	80 · 120
			Total Sulphur [S]	2019/12/20		44	*	20 - 120
3713860	MAP	Method 3 mil	Total Barium (Ba)	2015/12/20	<0.010		mg/L	
			Total Boron (B)	2015/12/20	-0.020		mg/L	
			Total Calcium (Ca)	2015/12/20	<0.30		mg/L	

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

Nuclear Project#.	655352	Contract#:	255095	Page:	145 of	201
Customer Doc#:		Customer:	Saskatchewan F	Research Cour	ncil (SRC)	



Report Date: 2020/01/07

Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

# QUALITY ASSURANCE REPORT(CONT'D)

Setch	mit	QCType	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limit
where the P	405	deille	Total Iron (Fe)	2015/12/20	<0.060		mg/L	
			Total Lithium (Li)	2019/12/20	-10.02.0		mg/L	
			Total Magnesium [Mg]	2019/12/20	<0.20		mg/L	
			Total Mangamese (Min)	2019/12/20	<0.0040		ms/L	
			Total Phosphorus (P)	2015/12/20	<0.10		mg/L	
			Total Fotassium (K)	2019/12/20	-0.30		mg/L	
			Total Silican (Si)	2015/12/20	<0.10		mg/L	
			Total Socium (Na)	2019/12/20	<0.30		mg/L	
			Total Strontium (3r)	2015/12/20	-0.020		mg/L	
			Total Sulphur [S]	2019/12/20	=0.20		mg/L	
713960	MAP		Total Barium (Ba	2019/12/20	19		5	20
1.1396.0	10.001	nru -	Total Eoron (B)	2315/12/20	1.3		5	20
			Total Calcium (Cal	2019/12/20	1.5		5	20
			Total Iran (Fe	2015/12/20	NE		5	20
					0.32		25	20
			Total Lith um [Li]	2019/12/20 2015/12/20	1.9		5	20
			Total Magnesium (Mg)		NC		5	20
			Total Manganese (Mn)	2019/12/20	NE		5	20
			Total Phosphorus (P)	2019/12/20	2.2		2	20
			Total Potassium (K)	2019/12/20			5	
			Total Silicon (Si)	2019/12/20	1.6			20
			Total Sodium (Na)	2015/12/20	1.0		5	2.0
			Total Strontium (Sr)	2019/12/20	1.8		5	20
			Total Sulphur (S)	2015/12/20	1.6		5	20
713958	LLO	Matrix Saike [ND4157-12]	Total Petro eum Hydrocarcon	2015/12/20		9:9	35	70 - 13
713558	LLO	Spiked Blank	Total Petroleum Hydrocardon	2019/12/20		25	5	70 - 13
9713998	LLO	Method Blank	Total Petro eum Hydrocaroon	2015/12/20	<2.0		mg/L	
9714645	NK3	Matrix Spike	D10-ANTHRACENE (sur.)	2019/12/19		100	5	30 - 13
			DB-ACENAPHTHYLENS (sur.)	2015/12/19		100	3	30 - 13
			DB-NAPHTHALENE (sur.)	2019/12/19		84	5	10-1
			TERFHEN VL-D14 (sur.)	2015/12/19		:25	35	30 - 13
			Acenaphthene	2019/12/19		23	3	20-14
			Asensahthylene	2019/12/19		8.9	3.3	20 - 13
			Acrizice	2019/12/19		8.8	2,3	30 - 13
			Anthracene	2015/12/19		2.3	5	20 - 13
			Berze anthracene	2019/12/19		101	35	30~13
			BergolbSijflupranthene	2015/12/13		50	3	30~13
			Beras & fluoranthene	2013/12/19		103	3	20 - 13
			Benzoig, fullperviene	2019/12/19		53	35	20-13
			Bendo (c) phenanthrene	2019/12/19		110	35	20~13
			Berca s'avrene	2015/12/19		58	35	30-13
			Bergstelpyrene	2015/12/19		515	25	20-13
			Chrysene	2019/12/19		100	35	50 - 13
			O bergis h sathracene	2013/12/19		92	25	20-13
			Fuoranthene	2015/12/19		109	5	20 - 13
			Fluorene	2019/12/19		2.3	25	20 - 13
			indeno[1,2,3-td]pyrene	2013/12/19		83	3	30-13
			1-Methylnaphthalene	2015/12/19		88	25	30 - 13
			2-Methyinaphtheiene	2015/12/19		80	5	10-13
			Nachthaicre	2019/11/19		50	5	10 - 13
			Phenanthrane	2015/12/19		57	35	30 - 13
			Parylane	2015/12/19		50	3	30-13
			Parene	2019/12/19		105	5	30-13
			Quingine	2019/12/19		101	2	20-13
		Spiked Blank		AN 13/ 11/ 13		202	3	- 1 C

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDF	R-002	Rev:	0	
Nuclear Project#:	655352	Contract#	255095	Page:	146 of	201	
Customer Doc#:		Customer	Saskatchewan Research Council (SRC)				
Title:	END STATE D	ECOMMISSIONIN	G REPORT FOR	SRC SLOWPC	KE-2		

FACILITY



Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

# QUALITY ASSURANCE REPORT(CONT'D)

QA, QC								
Bettch	Init	QCTYPE	Parameter	Date Analyzed	Value	Recovery	UNITS	QE Limit
			DB-ACENAPHTHYLENE (sur.)	2013/12/19		5-3	3	20 - 130
			DE-NAPHTHALENE (SUL	2013/12/19		20	3	20-13
			TERPHEN VL-D14 (sur.)	2013/12/19		127	23	30-13
			Atenaphthene	2013/12/19		50	3	50 - 130
			Atenaphthy ene	2013/12/19		51	3	20-13
			Acridine	2019/12/19		51	3	10-13
			Anthracene	2015/12/19		8.7		20 - 130
			Serco (s) anthracene	2013/12/19		105	5	50 - 13
			Serco baj Muoranthene	2015/12/19		51	5	30 - 130
			Benzo(k)fluoranthene	2013/12/19		105	5	30 - 13
			Seracig.hulperpiene	1013/12/19		54	5	20 - 13
			Seras(c)phenenthrene	2019/12/19		110	25	30 - 130
			Senzo a pyrene	2019/12/19		53	5	50 - 132
			Benzo (e) pyrene	2013/12/19		SB	29	30 - 130
			Chaysene	2013/12/19		104	3	30 - 13
			Dipenzia hienthracene	2019/12/19		92	5	30 - 13
			Fluorenthene	2015/12/19		109	*	30 - 130
			Fluorene	2019/12/19		8.8	3	30 - 130
			indeno(1,2,3-co)pyrene	2015/12/19		E5	35	50-130
			1-M ethylnaphthalene	2015/12/19		23	5	50 - 130
			2-Methylnaphthalene	2013/12/19		77	5	30-130
			Naphthalere	2015/12/19		87	3.	50 - 130
			Phenanchiene	2013/12/19		\$7	5	30 - 13
			Perviene	2013/12/19		55	3	30 - 133
			Pymene	2013/12/19		105	*	30 - 130
714646	NKB	Method Blan	Quinsine	2013/12/19		101	*	30 - 130
14645	NKB	Method Biana	D10-ANTHRACENE (sur.)	2013/12/20		552	5	30 - 130
			DB-ACENAPHTHYLENE	2013/12/20		106	5	30 - 133
			DB-NAPHTHALENE (SUR.)	2019/12/20		2.4	3	50 - 130
			TERPHENVL-D14 (sur.)	2019/12/20		150 (1)	3	30 - 130
			Azensahthene	2015/12/20	0.10		ug/L	
			Acensofithylene	2015/12/20 2015/12/20	<8.10		LGIL	
			Anthresene				LSIL	
			Benzzisjenthracene	2019/12/20 2019/12/20	0.020		LEIL	
			Berzolo & Thuoranthane	2019/12/20	<0.0085		LEL	
			Benap k fluoranchene		<0.0085		US/L	
			Benzo g, h. Jperviene	2013/12/20 2013/12/20	<0.0085		ug/L	
							ug/L	
			Benzo [c]phonanthrene Benzo [s] by rene	2015/12/20 2015/12/20	<0.000		US/L	
			Benadle pyrene	2013/12/20	10.000		ug/L	
			Chrysene	2313/12/20	<0.8085			
			Diberaja hisnthracene	2019/12/20	<0.0075		ugit	
			Fluorarthene	2015/12/20	-0.010		ug/L	
			Fluerene	2019/12/20	40.020		-	
			inceno 1,2,3-co pyrene	2019/12/20	0.000		ug/L ug/L	
			1-Methylaphthalene	2019/12/20	0.10		-	
			2-Methylnaphthalene	2019/12/20	<0.10		ug/L ug/L	
			Naphthalene	2015/12/20	<0.10 (0.10		ug/L	
			Phenenthrene	2015/12/20	<0.030		_	
			Perviene	2015/12/20	<0.020		ug/L	
			Pyrene	2015/12/20	40.020		ug/L	
			Quineáne	2019/12/20	<0.20		ug/L	
		RPD	Acenaphibene	2/019/12/20	<0.20		ug/L	

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#	147-01600-ESDR-002	2	Rev:	0
Nuclear Project#:	655352	Contract#:	255095	Page	147 of	201
Customer Doc#:		Customer	Saskatchewan Rese	arch Cou	ncil (SRC	:)
Title:	END STATE DI FACILITY	ECOMMISSIONIN	IG REPORT FOR SRC	SLOWPO	OKE-2	



Report Date: 2020/01/07

Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

# QUALITY ASSURANCE REPORT(CONT'D)

QA/QC								
Batch	Init	QC Type	Persmeter	Date Analyzed	Value	Recovery	UNITS	QC L ni
			Acerephin, ene	2013/12/20	NC		3	30
			Acridine	2019/12/20	NC		3	30
			Anthracane	2019/12/20	NC		5	30
			Benzalajanthracene	2019/12/20	NC		5	30
			Serus baj musranthene	2019/12/20	NC		25	50
			Berrap & fluoranthene	2019/12/20	NC		5	30
			Berzo g.h. pervene	2019/12/20	PVC		5	50
			Benzo [t] phenanthrene	2019/12/20	THE		3	30
			Benzo a pyrene	2019/12/20	NC		5	50
			Benzo je ipyrene	2019/12/20	NC		16	30
			Chrybene	2019/12/20	NC		25	50
			Dibera a hjanthracene	2019/12/20	INC.		5	30
			Fluoranchene	2013/12/20	NC		3	30
			Fluorene	2015/12/20	NC		5	30
			indeno(1,2,3-cd)pyrene	2019/12/20	NC		5	30
			1-Methyinaphthaler e	2019/12/20	NC		3	30
			2-Methylnaphthaler e	2019/12/20	NC		*	50
			Naphthalene	2019/12/20	NC		3	30
			Phenonthrene	2019/12/20	NC		5	30
			Ferviene	2019/12/20	NC		5	50
			Pyrene	2019/12/20	NC		5	30
			Quino ins	2013/12/20	THC		15	30
9714648	PKB	Spilled Blank	Biochemical Oxygen Demand	2013/12/24		122 [1]	*	25-1
9714645	2=2	Method Bisnk	Biochemical Oxygen Demand	2019/12/24	<2.0		mg/L	
3714643	PKB	RPD	Sinchemical Oxygen Demand	2019/12/24	3.1		5	20
1643B	TYU	Matrix Spike	Phenois	2.019/12/2.3		93	35	80 · 1.
971543 B	TMU	Spiked Blank	Phenois	2019/12/25		2.4	5	80 - 13
9716438	TMU	Method Ban .	Phenois	2015/12/23	-0.0013		mg/L	
9715435	TMU	RPD	Phenois	2013/12/23	INC		75	20
9715741	MZ	Matrix Spike	1,4-Difluoropenzene (sur.)	2013/12/21		53	2	30-14
			4-Stamofluorabensele (sur.)	2019/12/21		50	5	20 - 14
			D4-1,2-Dichloroethane  sur	2019/12/21		113	3	30-1-
			Senzene	2019/12/21		NC	5	20-1-
			Bra modichlaromethane	2019/12/21		96	35	20 - 14
			Bramoform	2015/12/21		55	3	30 - 14
			Bramometrane	2015/12/21		23	5	30 - 1-
			Caraon tetrachiorice	2019/12/21		89	35	30-1-
			Chlorobenzene	2019/12/21		8.3	25	30 - 14
			Chierod bromomethane	2019/12/21		9.3	5	50 - 14
			Chiorpethane	2019/12/21		53	5	20 - 14
			Chioroform	2018/12/21		81	5	30 - 1-
			Chioromethane	2019/12/21		53	15	30 - 14
			1,2-dibromoethane	2019/12/21		53	5	50 - 14
			1,2-sichlprotenzene	2019/12/21		91	*	30 - 14
			1,3-sichlorotenzene	2019/12/21		92	5	50 - 1-
			1,4-sichlorotensens	2019/12/21		91	5	30 - 1-
			1,1-dichloroethare	2013/12/21		87	5	50 - 14
			1,2-cichloroethane	2019/12/21		52	5	30-1/
			1,1-cichlaroethene	2019/12/21		8.4	5	10-1
			cit-1,2-o'ch croethene	2019/12/21		89	25	30 - 14
			trans-1,2-tich proethene	2019/12/21		78	5	30 - 1/
			Dichloromethane	2019/12/21		83	35	50 - D
			1,2-dichlaropropane	2019/12/21		97	35	20-14
			cis-1,3-d chloropropene	2019/12/21		104	3	30-1

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Survey Vertas Informationies Calgary: 2021-41at Avenue S.C. T27 672 Telephone (#23) 251-3077 Tele (#23) 231-3468

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDF	R-002	Rev:	0		
Nuclear Project#:	655352	Contract#	255095	Page:	148 of	201		
Customer Doc#.		Customer: Saskatchewan Resea						
TiNo:	END STATE D	ECOMMISSIONIN	G REPORT FOR	SRC SLOWPO	OKE-2			

Title: FACILITY



Saskatchewan Research Council Client Project # 11526 Sampler Initials: DC

# QUALITY ASSURANCE REPORT(CONT'D)

Setch Init C	астуре	Parameter	Date Analyzed	Value	Retovery	UNITS	QCLIM
		trans-1.3-dichloropropene	2015/12/21		135	5	10-1-
		Ethylpencens	2015/12/21		NC	3	20-14
		Methyl methacrylate	2019/12/21		101	35	20-1-
		Methyl-tert-butylether (MTBE)	2013/12/21		8-5	35	30-14
		Styrene	2015/12/21		95	25	30-1
		1,1,1,2-tetrachioroethane	2013/12/21		E.B	35	50-1
		1,1,2,2-tetrachiorpethane	2015/12/21		103	3	10 - 1
		Tetrachiorcethene	2015/12/21		78	35	20-1
		Toluene	2015/12/21		NC	35	50 - 1
		1.2,3-trichlorspensene	2015/12/21		110	3	20 - 1
		1,2,4-trichloropenzene	2019/12/21		107	3	50 - 1
		1,3,5-trichlorspenzene	2013/12/21		031	2.	30-1
		1.1.1-trichloroethane	2015/12/21		54	3	20 - 1
		1,1,2-trichlorsethane	2019/12/21		135	3	20 - 1
		Trichiorgethere	2013/12/21		53	2	10-1
		Trichlorofluorom ethanie	2013/12/21		84	3	20-1
		1.2.4-trimethyldenzene	2019/12/21		NC	*	30 - :
		1,3,3-trimethy benzene	2015/12/21		NC	35	10-1
		VinyIchloride	2013/12/21		87	35	50 - 3
		m & c-kylene	2015/12/21		NC	-	30-
		o-t, ene	2015/12/21		NC	3	10-1
718741 MZ S	oked Blank	1.4-Difuoropenzene (aur.)	2015/12/21		100	35	30-3
		4-6romofluorobensene isur. I	2019/12/21		:05	3.	30-3
		D4-1,2-Dichloroethane (tur.)	2015/12/21		ES	5	10-1
		Records	2015/12/21		90	5	EQ - 1
		Bromodichloromethane	2015/12/21		99	3	60-1
		Bramoform	2015/12/21		101	5	60-1
			2015/12/21		55	2	
		Bromomethane Carcon tetrachioride			95	3	60 - : 60 - :
		Chiprobenzene	2015/12/21 2015/12/21		50	3	e0-1
		Chlorad promomethane	2015/12/21		101	5	60-1 60-1
		Chioraethene	2019/12/21		92	-	
		Chieroform	2013/12/21		87	5	60 - 3
		Chioramethane	2013/12/21		104	3	€0 - :
		1.2-dibromoethane	2019/12/21		95	5	€:0 - :
		1,2-dichlorobenzene	2019/12/21		101	5	€.0 - :
		1.3-dialorotentene	2015/12/21		57	25	£0 - :
		1.4-dichibrobensene	2015/12/21		2	5	60-1
		1,1-dichldroethane	2015/12/21		53	5	£0 - :
		1,2-dichloroethane	2015/12/21		91	2	60-:
		1,1-dichloroathere	2015/12/21		50	5	60-1
		cis-1,2-cich orbethene	2015/12/21		94	30	E-0 - 1
		trans-1.2-dichloroethene	2015/12/21		8.4	36	60-:
		Dichloromethane	2013/12/21		8.5		€Q - :
		1,2-sichloropropane	2013/12/21		103	3	60-1
		cit-1,3-dichloropropene	2015/12/21		110	36	€0 - 1
		trans-1,3-tichitropropene	2015/12/21		11.3	35	€0 - 1
		Ethylbergene	2015/12/21		94		€0 - 1
		Methyl methacrylate	2019/12/21		107	*5	60 - J
		Methyl-tert-putylether (MTBE)	2015/12/21		99	5	60 - 1
		Styrene	2015/12/21		102	35	60 - 1
		1.1.1 2 Hetrachlorpethane	2019/12/21		95	5	EO - 1
		1,1,2,2-tetrachiorgethane	2015/12/21		59		60 - 1
	Tetrachiorgethene	2015/12/21		8.8	5	EQ - 1	

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Sureau Vettas Laboratorias Cagary 2001-41st Avenue N.C. T20 070 Telephone (H03) 201-0077 (http://doi.org/10.1011/201-0408

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

Nuclear Project#:	655352	Contract#:	255095	Page:	149 of 2
Customer Doc#:		Customer	Saskatchewan Resear	ch Coui	ncil (SRC)
Title:	END STATE DI FACILITY	ECOMMISSIONIN	IG REPORT FOR SRC S	LOWPO	OKE-2



Report Date: 2020/01/07

Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

## QUALITY ASSURANCE REPORT(CONT'D)

Esten	mit	QCType	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limi
			Тоциале	2019/12/21		53	16	60-13
			1,2,3-trichloroDenzene	2019/12/21		5-3	3	60 - 13
			1,2,4-trichlorspensene	2015/12/21		50	3	60 - 13
			1,3,5-trichlorspensene	2019/12/21		<b>E</b> 9	5	60 - 13
			1,1,1-trich lorgethane	2019/12/21		59	2.5	60~13
			1,1,2-trichlorgethane	2015/12/21		59	3.2	60-13
			Trichlorgethene	2015/12/21		59	2	60 - 13
			Trichlorofluoromethane	2019/12/21		90	75	60 - 13
			1.2.4-trimethylbersene	2013/12/21		103	35	60 - 13
			1.3,5-trimethylbenzene	2019/12/21		100	35	60 - 13
			Vinyichloride	2019/12/21		52	3	E0-1.
			m & p-Xylene	2015/12/21		91	5	€0 - 13
			o-Xviene	2019/12/21		83	3	60 - 13
715741	MZ	Methoo Bians	1,4-Difluoropenzene (sur.)	2015/12/21		53	25	30-14
			4-Sramofluorabenzene (sut.)	2015/12/21		57	15	30-14
			D4-1,2-Dichtoroethane (sur.)	2015/12/21		55	3	20-1-
			Benzene	2013/12/21	c0.40		ugiL	
			Bramodichiaromethane	2/013/12/21	(0.50		ug/L	
			Bramotorm	2019/12/21	CB.20		ug/L	
			Bromomethane	2019/12/21	<2.0		ug/L	
			Carbon tetrachigride	2015/12/21	CD.20		ug/L	
			Chlorobenzene	2013/12/21	<0.30		ug/L	
			Chiorod promis methane	2013/12/21	c1.0		ug/L	
			Chioroethane	2015/12/21	<1.0		ug/L	
			Chioraform	2015/12/21	<0.30		ug/L	
			Chioromethane	2015/12/21	12.0		ug/L	
			1.2-dibromoethene	2013/12/21	<0.20		ug/L	
			1,2-dichiorobenzere	2019/12/21	<8.30		ug/L	
			1.3-dichiprobenzene	2019/12/21	62.0>		ug/L	
			1.4-sichlorobenzene	2015/12/21	0.20		ug/L	
				2019/12/21	0.30		ug/L	
			1.1-sichioroethare	2019/12/21	<0.20		ug/L	
			1.2-dichloroethane	2019/12/21	02.00		ug/L	
			1,1-tichloroethere				-	
			cis-1,2-cichloroezhene	2019/12/21	<8.30		Ug/L	
			trans-1.2-dichloroethene	2019/12/21	<0.50		ug/L	
			Dichloromethane	2019/12/21			ug/L	
			1,2-dichlaropropane	2019/12/21	<0.30		ug/L	
			cis-1,3-dichloropropene	2015/12/21	-0.20		ug/L	
			trans-1,3-dichioropropene	2019/12/21	0.20		US/L	
			Ethylbenzene	2019/12/21	<0.40		ug/L	
			Methyl methachylate	2019/12/21	-0.50		ug/L	
			Methyl-tert-butylether (NTBE)	2019/12/21	<0.30		ug/L	
			Styrene	2019/12/21	<8 10		US/L	
			1,1,1,2-tetrachioroethane	2019/12/21	<1.0		ug/L	
			1,1,2.2-tetrachioroethane	2019/12/21	<2.0		ug/L	
			Tetrachloroethene	2015/12/21	<8.20		ug/L	
			Toluene	2019/12/21	<0.40		us/L	
		1,2,3-trichloropensene	2019/12/21	<1.0		us/L		
		1,2,4-trichlorobenzene	2013/12/21	<1.0		ug/L		
		1,3,3-trichlorobenzene	2019/11/21	×0.30		ug/L		
		1,1,1-trichloraethane	2019/12/21	<0.30		ug/L		
			1,1,2-trichlorseshane	2019/12/21	0.30		ug/L	
			Trichloroethene	2019/12/21	<0.30		ug/L	
		Trichlorofluoromethane	2019/12/21	×0.30		ug/L		

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furnes Vertin Laboratories Calgory: 2021-40:e Avenue N.S. VIX 673 Telephone (403) 201-3077 Peri/405(231-3408

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#.	147-01600-ESDR	-002	Rev: 0
Nuclear Project#.	655352	Contract#:	255095	Page.	150 of 201
Customer Doc#:		Customer:	Saskatchewan F	lesearch Cour	ncil (SRC)
Title:	END STATE D	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPC	KE-2

FACILITY



Saskatshewan Research Council Client Project #: 11526 Sampler Initials: DC

# QUALITY ASSURANCE REPORT(CONT'D)

QA/QC								
Betch	. nit	QCType	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limit
			1.2,4-trimethy benderie	2013/12/21	-9.50		ug/L	
			1.3 3-trimethy benzene	2019/12/21	0.30		ug/L	
			Vinyi chloride	2019/12/21	<0.30		Ng/L	
			Rylanes (Total)	2019/12/21	<0.2.0>		US/L	
			m & p-kylene	2013/12/21	C3.0>		ug/L	
			o-sylene	2/013/12/21	0.40		ug/L	
9715741	MZ	RPC	Bremodichleromethane	2019/12/21	NC		25	30
			are notorn	2015/12/21	NE		35	50
			Bromomethane	2015/12/21	NC		35	50
			Carbon tetrachieride	2015/12/21	NC		35	50
			Chiorobenzene	2013/12/21	NC		16	50
			Chiorodiaromomethane	2013/12/21	NC		35	30
			Chlorcethane	2019/12/21	NC		36	50
			Chioroform	2019/12/21	NC		35	30
			Chloromechane	2019/12/21	0.26		25	50
			1.2-tibromoethane	2013/12/21	NC.		25	50
			1.2-dichlorobenzene	2013/12/21	NC		3	50
			1.3-michlarobensene	2013/12/21	NC		3	30
			1,4-dichlorocenzene	2013/12/21	NC		5	30
			1.1-sichlaroethane	2019/12/21	NC		3	30
			1,2-dichlaroethane	2015/12/21	NC		2.5	30
			1,1-dichiproethene	2015/12/21	NC		2.	30
			cis-1 1-c ch orgethene	2013/12/21	NC		35	50
			wans-1,2-dichloroethene	2019/12/21	NC		3	30
			Dichloromethane	2019/12/21	NC		2	50
			1.2-dichlerocropane	2019/12/21	NC		5	30
			cis-1,3-d thioropropene	2015/12/21	NE		2	50
			trans-1.3-sichleroprogene	2015/12/21	NC		-	30
			Methyl methacrylate	2019/12/21	NC		3	50
			Methyl-tert-butylether [MTSE]	2015/12/21	NE		8.	30
			Styrene	2019/12/21	NC		25	30
			1.1.1.2-tetrachioroethane	2015/12/21	NC		3	30
			1.1.2 2-tetrachioroethane	2013/12/21	NC		5	30
			Tetrach groethene	2019/12/21	NC		3	30
			1.2.3-trichloropensene	2015/12/21	NC		35	50
			1.2,4-trich propensene	2015/12/21	NC		3	50
			1.3.5-trichioropensene	2015/12/21	NC		3	30
			1.1.1-trichlorgethane	2019/12/21	NC		34	30
			1.1.2-trichlorosthane	2013/12/21	NE		3	50
			Trishloraethene	2013/12/21	NC		3	50
			7 chlorofluoromethane	2019/12/21	NC		5	>0 30
			1,2,4-trimethy Denzene	2015/12/21	3.4		3	50
			1.3.3-stimethy benzene	2015/12/21	2.4		5	50 50
			Vinyl chloride	2013/12/21	NC NC		3	30 30
717934	FRE	Matrix Spika (ND4197-05)	Chemical Oxygen Gemand	2019/12/21		104	3	50 20 - 13
717834	PRE	Spiked Blank	Chemical Davgen Gemand	2015/12/21		104	5	80-12
717834	FRE	Method Blan				20		29-12
717934	FRE	RPC (XD4137-BE)	Chemical Oxygen Gemand Chemical Oxygen Gemand	2013/12/21	<10 NE		mg/L	
718185	CIY	Matrix Spike	Total Mercury (Hg)	2015/12/21	INC.			20
715185		and the second se		2013/12/23		82	5	80-12
715185	CIY	Spiked Blank Method Blank	Total Mercury (Hg)	2013/12/23		100	15	£0 - 12
		REC SIGNA	Total Mercury (Hg)	2015/12/25	<0.0020		ug/L	
715185	CIY		Total Mercury (Hg)	2013/12/23	NC		3	20
718621	PKS	Matrix Spike	Total Sulphide	2015/12/25		NC	25	80-12
718621	FER	Spiked Blank	Total Suiphide	2:019/12/2.3		55	75	80-12

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Survey Verse laboratories Capacy: 2021 - 4 in Avenue 5 C 120 STL Teleptone (402) 251-3077 Feb (402) 21-3460

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#.	147-01600-ESDR-002		Rev.	0
Nuclear Project#:	655352	Contract#:	255095	Page:	151 o	f 201
Customer Doc#:		Customer:	Saskatchewan Resear	ch Cou	ncil (SR	C)
Title:	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FOR SRC S	LOWPC	OKE-2	



Report Date: 2020/01/07

Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC

# QUALITY ASSURANCE REPORT(CONT'D)

QA/QC	1.10			Date Analyzed	Value	Recovery	UNITS	QC Limit
Batch 1712621	Init	QCType Method Slank	Parameter	2019/12/23	-0.0018	Recovery	mg/L	us come
9718621	PKE	RPD	Total Sulphide	2019/12/23	1.2		5	20
9719361	EH2	Matrix Spike	Total Suspender Solid:	2019/12/24	**	\$7	3	80-120
9719361	EH2	Solked Blank	Total Suspended Solids	2019/12/24		92	5	50-120
				2019/12/24	d.0	32		20-120
9719361	EHZ	Method Blank	Total Suspendes Solids	2019/12/24	19		mg/L	20
9719561	EH2		Total Suspendez Solids		13		5	20
9719650	21	Masrix Spike	Distolved Sulphate (SO4)	2015/12/24		103	5	
9719650	21	Spiked Blank	Dissolved Sulphate (SO4)	2019/12/24		59		80 - 120
9719650	2)	Method Blank	Distorved Sulphate (SO4)	2019/12/24	c1.0		mg/L	1.1
9719690	Z)	RFC	Dissolved Sulphate (SO4)	2013/12/24	NC		5	20
9721299	.LD	Matrix Spile [KD4197-05]	Total Tetal Kjeldahl Nitrogen	2019/12/27		102	5	20-120
9721293	1LD	QC Standard	Total Total Kjeldahi Nitrogan	2015/12/27		64	5	80 - 120
9721259	JLD	Spiked Blank	Total Total Kjeldahi Nitrogen	2019/12/27		55	5	80-120
9711259	.1.0	Nethod Siank	Total Total Kjeldahl Nitrogen	2019/12/27	0.030		mg/L	
9721259	5.0	RPD (ND4157-DE)	Total Tatal Kjeldahl Nitrogen	2019/12/27	NC		25	2.0
9721359	JLD.	Matrix Spike	Total Phosphorus (P)	2019/12/30		NC	5	80-120
9721399	11.0	QC Standard	Total Phospherus (P)	2019/12/27		56	35	EO - 120
9721399	JLD.	Spiked Blank	Total Phosphorus (P)	2019/12/27		58	3	80-120
5721359		Method Blank	Total Phosphorus (P)	2019/12/27	+0.0050		mg/L	
9721399		RFO	Total Phosphorus (P)	2015/12/30	6.1 (2)		36	20
9723114	TIC	Metrix Spike	Nonyiphens (Total)	2019/12/27		<u>***</u> *	5	30 - 130
5723114	TJC	Spiked Blank	Nony phenal (Tatal)	2019/12/27		105	35	30-130
9723114	TIC	Method Blank	Nonyotena (Tota)	2013/12/27	-0.0010		mg/L	
9723115	TJC	Matrix Spike	Nonylphene Ethoxy ate (Total)	2019/12/27		54	5	30-130
9723115	TJC	Spilled Blan	Nony phenol Ethory ate (Total)	2019/12/27		53	5	20-130
9723115	TJC	Method Blank	Nonyioheno Ethow, ate (Total)	2013/12/27	-0.625		mg/L	
9723115	TJC	RFO [ND4197-14]	Nonyipheno Ethowy ate (Total)	2015/12/28	NC		35	40
9727625	éfk	QC Standard	Cesium-134	2015/12/27		103	35	N/A
			Cepium-237	2015/12/27		107	2	74/A
			Coomit-60	2013/12/27		102	35	N/A
			locine-13:	2015/12/27		85		N/A
9727685	<b>ÉFK</b>	Method Blank	Cesium-134	2013/12/30	<1		Eq/I	
			Cesium-237	2019/12/30	ct		Eq/I	
			Ceshicco2	2015/12/30	<1		Bc/I	
			locine-131	2015/12/30	<1		Big/I	
			Manganese-34	2019/12/30	<1		Bq/I	
			2 nc 63	2019/12/30	<#		Bg/I	
9727625		OC Standard	Radium 226	2015/12/24		94	*	74 - 123
			Uranium-235	2019/12/24		101	35	74 - 125
9727685		Method Blag	Radium 225	2019/12/25	<1.0		Bg/I	

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Turney Verton Laboratoriae Calgory 2021-418: Namus N.E. 725 673 Telephone (403) 291-3077 Tel. (403) 291-6400

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

Doc#:	147-01600-ESDR-002	
DOC#.	147-01000-ESDK-002	

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Rev:	- U
1101.	

Nuclear Project#:	655352	Contract#.	200000	Page	152 of 201
-					

Customer Doc#:

Customer: Saskatchewan Research Council (SRC)

#### END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 Title: FACILITY



Report Date: 2020/01/07

Saskatchewan Research Council Client Project # 11526 Sampler Initials: DC

# QUALITY ASSURANCE REPORT(CONT'D)

q.A./q.c								
Satch	Init	QC Type	Parameter	Date Analyzed	Value	Ferdinery	UNITS	QC Limits
			Uranium-23.5	2019/12/25	<0 20		8q/1	
Ouplicate	: Paire	a ematysis of a sepe	rete portion of the same sample. Used to er	valuate the variance in the measure	ment.			
Matrix So	oike: A	semple to which e	nown amount of the analyte of interest has	been added. Used to evaluate sam	ple matrix inte	erterence.		
QC Stand	and: A :	ample of known co	ncentration preserved by an external agency	under stringent conditions. Used	as an independ	tent check of me	thed accur	acv.
Solked Bu	anin Al	lank matrix sample	to which a known amount of the analyte, a	in the frame a second to une has be	en added Line		ethor acro	ITS CC
							611 / G BEE.	n well.
			aining all reagents used in the analytical pro					
Suirogets	e: A pu	re or iscapically las	teled compound whose behavior mimors th	e and ytes of interest. Used to evalu	ste a viraction	efficiency.		
			he matrix spike was not calculated. The rela covery calculation (matrix spike concentrati				d the spik	e amount
NC (Dupli difference			PO was not calculated. The concentration in	the sample and/or duplicate was to	so law ta perm	nit a relieple RPD	Calculation	n (sato ute
(1) Reco	very of	RPD for this para	meter is outside control limits. The over	all quality control for this analysi	s meets acce	ptability criteri	a.	
(2) Deter	ction li	mits raised due to	dilution to bring analyte within the cali	brated range.				

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Bureau Vertas Laboratories Calgory: 2021 - 41st Avenue N.C. T2E 570 Telephone (403) 251-3077 Fax (405) 251-2455

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

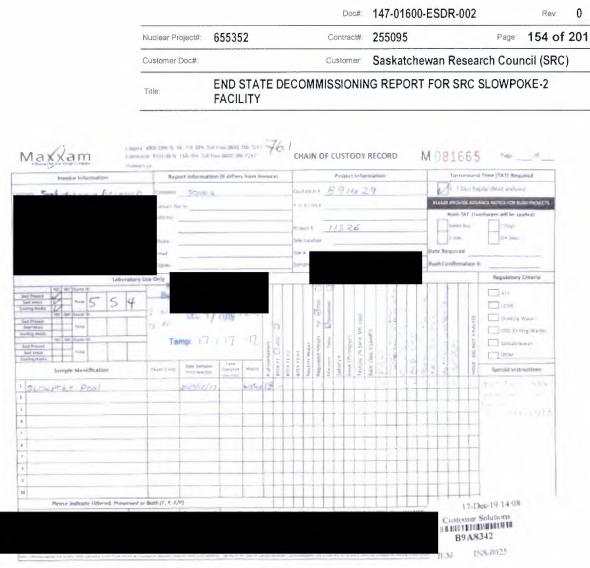
Local:       147-01600-ESDR-002       Rec: 0         Nuclear:       655352       Contract:       255095       Page: 153 of 20'         Custome:       Saskatchewan Research Council (SRC)       Trie:       END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2         FACILITY       FACILITY       Saskatchewan Research Council (SRC)       Trie:       END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2         FACILITY       Saskatchewan Research Council (SRC)       Saskatchewan Research Council (SRC)       Trie:         FACILITY       Saskatchewan Research Council (SRC)       Saskatchewan Research Council (SRC)       Saskatchewan Research Council (SRC)         Face:       DEDEE:       DEDEE:       DEDEE:       Saskatchewan Research Council (SRC)         VALIDATION SIGNATURE PAGE       Saskatchewan Research Council (SRC)       Saskatchewan Research Council (SRC)         VALIDATION SIGNATURE PAGE       Saskatchewan Research Council (SRC)       Saskatchewan Research Council (SRC)         VALIDATION SIGNATURE PAGE       Saskatchewan Research Council (SRC)       Saskatchewan Research Council (SRC)								
Customer Doc#:       Customer.       Saskatchewan Research Council (SRC)         Title:       END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2         FACILITY       FACILITY         Saskatchewan Research Council       Client Project #: 11526         Sampler Initials: DC       Sampler Initials: DC				Doc#.	147-01600-ESDR-002		Rev:	0
Title: END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2 FACILITY  Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC  VALIDATION SIGNATURE PAGE		Nuclear Project#:	655352	Contract#:	255095	Page:	153 of 2	201
FACILITY FACILITY FACILITY Saskatchewan Research Council Client Project #: 11526 Sampler Initials: DC VALIDATION SIGNATURE PAGE		Customer Doc#		Customer:	Saskatchewan Resear	ch Cour	ncil (SRC)	
BV Labs Job #: B9A0342 Saskatchewan Research Council Report Date: 2020/01/07 Client Project #: 11526 Sampler Initials: DC VALIDATION SIGNATURE PAGE		Title:		ECOMMISSIONIN	NG REPORT FOR SRC S	LOWPC	)KE-2	
	BV Labs Job #: B9A8342			Client	Project # 11526			
			VALIDATIONS					
	The analytical data and all 0	C contained in this rea			wine individual(s)			
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BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Bureau Vertisc Laboratories Cargony: 2023 - 41st Avenue N.C. TSE 572 Telephone (403) 251-3077 fau (403) 233-4468

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		Doc#:	147-01600-ESDF	R-002	Rev.	0
Nuclear Project#:	655352	Contract#	255095	Page.	155 of	201
Customer Doc#:		Customer:	Saskatchewan F	Research Cour	ncil (SRC	)
Title:	END STATE DI FACILITY	ECOMMISSIONIN	G REPORT FOR	SRC SLOWPC	OKE-2	

REACTOR POOL 19-12-17. Rpt

ORTEC g v - i (1215) ENV32 G53W4.25 1/10/2020 11:58:39 AM Page 1 Spectrum name: REACTOR POOL 19-12-17.An1

Sample description

Spectrum Filename: C:\User\Reactor Samples\REACTOR POOL 19-12-17.An1 Acquisition information Start time: 12/17/2019 2:36:30 PM Live time: Real time: Dead time: 9293 10184 8.74 % Detector ID: 1 Detector system GAMMASPEC MCB 129 det 1 Calibration Filename: DET 1 MARN 2008-43-6 19-12-23.Clb DET 1 2019 DEC MARN Energy Calibration Created: 12/23/2019 11:59:27 AM 0.201 keV 0.250 keV/channel Zero offset: Gain: -4.328E-09 keV/channel^2 Quadratic: Efficiency Calibration 12/23/2019 11:59:52 AM created: Knee Energy: 383.75 kev Above the Knee: Log(Eff): Uncertainty = 1.87 % Quadratic Quadratic Uncertainty = 1.87 % 1.043489E+01 + (-3.502056E+00\*Log(E) ) + ( 1.893361E-01\*Log(E)^2 ) Quadratic Uncertainty = 1.88 % -1.219382E+01 + ( 4.101557E+00\*Log(E) ) + ( -4.493891E-01\*Log(E)^2 ) Below the Knee: Log(Eff): Library Files Main analysis library: Library Match Width: Peak stripping: reactor water.Lib 0.500 Library based Analysis parameters Env32 G53W4.25 50 ( 12.68keV ) Analysis engine: Start channel: 50 ( 12.68keV ) 8000 ( 1996.35keV ) Stop channel: Peak rejection level: 100.000% Peak search sensitivity: Sample Size: 5.0000E-01 Activity scaling factor: 1.0000E+00/( 1.0000E+00= 5.0000E-01) = 2.0000E+00 Detection limit method: Reg. Guide 4.16 Method 0 ORTEC g v - i (1215) Env32 G53W4.25 1/10/2020 11:58:39 AM Page Spectrum name: REACTOR POOL 19-12-17.An1 2 Random error: 1.0000000E+00 Systematic error: 1.000000E+00 Fraction Limit: 0.000% Background width: best method (based on spectrum). Half lives decay limit: 12.000 Page 1

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

Doc# 14	17-01	600-	ESDR∙	002
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Nuclear Project#	655352	Contract#:	255095	Page:	156 of 201
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Title	END STATE D	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPO	DKE-2

Title: END

FACILITY

Activity range factor: Min. step backg. energy	EACTOR POOL 2.000 0.000 2.000	19-12-17.Rpt
Corrections Decay correct to date: Decay during acquisition: Decay during collection: True coincidence correction: Peaked background correction		Comments 12/17/2019 11:50:00 AM Det 1 Nat Bkg 19-10-11.Pbc 10/15/2019 11:30:43 AM
Absorption (Internal): Geometry correction: Random summing:	NO NO NO	

### total peaks alloc. 47 cutoff: 2.00E+01 % Energy Calibration Normalized diff: 1.0000

Peak S	UMMA					NGE	*****	Auc
Energy	Area	Uncert	FWHM	Factor	Nuclide Energy		Act. Bo/L	NUC
			_				10	
13.28	87.	17.27	0.80	1.013E-02				
					13.85			
16.24	75.	23.47	0.80	1.423E-02	15.80			
			1.00		16.60			
36.12	24.	57.93	0.82	3.795E-02	35.80			
					36.40			
					36.03			
					35.55			
					35.46			
46.65	84.		1.19	4.649E-02	46.60	2.100	1.853E+01	EU152
61.20	16.	\$7.87	0.85	5.360E-02	61.14	13.000	PBC <mda< td=""><td>W187</td></mda<>	W187
63.45	85.	25.58	1.15	5.437E-02				
67.29	29.	44.83	0.53	5.549E-02	66.91	12.500	9.070E-01	CS136
75.11	63.	27.14	0.86	5.715E-02				
77.07	59.	30.70	0.86	5.746E-02				
81.60	29.	50.66	0.75	5.803E-02	81.00	37.100	2.935E-01	XE133
					81.80	1.000	1.063E+01	SB125
89.65	16.	60.04	0.62	5.860E-02	89.96			
143,98	21.		0.27	5.455E-02	143.76			
163.44	45.		0.68	5.168E-02	163.35			
				· · · · · · · ·	162.93			
					163.93			
					163.89			
185.58	49.	28.68	0.97	4.825E-02				
203.30	43.	20.00	0.37	4.0252 02	185.99			
254.60	11.	63,49	0.25	3.826E-02	103.33	3.200	FBCSPUR	MALCO
295.59	71.		0.61	3.323E-02				
351.92	101.		1.22	2.747E-02				
479.54	20.		0.25	1.890E-02	479.57	23.400	PBC <mda< td=""><td>int a m T</td></mda<>	int a m T
661.57	72.		0.73	1.325E-02	661.62			
684.24	19.		0.28	1.325E-02 1.277E-02				
\$64.34	28.			1.017E-02	685.74	29.200	1.238E+00	W187
1460.50	20.		0.81		1460 75	10.700	PBC <mda< td=""><td></td></mda<>	
1400.20	2.	24.02	0.81	6.535E-U3	1460.75	10.700	PBC <mda< td=""><td>K40</td></mda<>	K40
*******								
	troid B	DENT			EAK		A R Y *****	
Channel	Energy	Counts		ints Cts/		igma %	FWHM Susper kev Nucli	
CHAILING 1	energy	counts	COL	into cto/.	sec z s	rigina x	Kev Nuclin	36
52.40	13.28		1.	94.	0.010	41.59	0.551 TH-23	4 5
64.27	16.24	12	6.	66.	0.007	62.87	0.740 Y-91M	
ORTEC	: g v - i	(1215)			1/10/2020			3
			5			OR FOOL	19-12-17 .An.	1
					Page 2			

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESD	R-002	Rev:	0
Nuclear Project#.	655352	Contract#.	255095	Page:	157 of	201
Customer Doc#:		Customer:	Saskatchewan	Research Cour	ncil (SRC)	)
Title <sup>.</sup>	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FOR	SRC SLOWPO	OKE-2	

REACTOR POOL 19-12-17.Rpt

Channe 1	Energy	Background	Net area	Cnts/sec	Uncert	FWHM Sus	pecte	d
186.13	46.65	68.	84.	0.009	40.41	1.192 EU	-152	5
253.43	63.45	121.	85.	0.009	51.15	1.154 PA	-234	SM
269.09	67.29	74.	28.	0.003	94.13	0.852 TA	-182	D
300.16	75.06	116.	63.	0.007	54.29	0.860 PB	-214	D
308.04	77.03	133.	59.	0.006	61.41	0.862 PB	-214	D
654.11	163.44	72.	45.	0.005	75.69	0.680 U-	235	SM
1019.43	254.60	19.	11.	0.001	126.98	0.250 SN	-113	S
1183.71	295.59	48.	71.	0.008	44.27	0.606 PB	-214	S
1409.45	351.92	22.	101.	0.011	25.59	1.224 PB	-214	S
3462.94	\$64.34	7.	28.	0.003	55.10	0.437 -		SM

s - Peak fails shape tests. D - Peak area deconvoluted. L - Peak written from unknown list. C - Area < Critical level. M - Peak is close to a library peak.

This section based on library: reactor water.Lib

	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensit Cts/Sec	2 Signa 5	
XE-133	142.65	35.80	86.	24.	0.003	115.86	0.8210
CS-137	0.00	36.40	0.	0.	0.000	0.00	0.000
W-187	244.19	61.14	93.	16.	0.002	175.74	0.8460
XE-133	326,19	81.60	68.	29.	0.003	101.32	0.746
U-235	358.43	89.65	65.	16.	0.002	160.07	0.6245
U-235	0.00	93.35	0.	0.	0.000	0.00	0.000
U-235	0.00	105.00	0.	0.	0.000	0.00	0.000
U-235	576.14	143.98	105.	21.	0.002	183.44	0.2725
U-235	0.00	163.35	0.	0.	0.000	0.00	0.000
U-235	743.41	185.72	85.	49.	0.005	57.35	0.9660
U-235	0.00		0.	0.	0.000	0.00	0.000
W-187	1920.84	479.54	13.	20.	0.002	84.20	0.2505
W-187	0.00	618.28	0.	0.	0.000	0.00	0.000
W-187	0.00		0.	Ő.	0.000	0.00	0.000
CS-137	2650.34		22.	72.	0.008	38.65	0.7335
W-187	2741.17	684.24	0.	19.	0.002	45.88	0.2815
AR-41	0.00	1293.60	0.	0.	0.000	0.00	0.000
-		. (1915)				. 20	
ORT				um name: Rf	EACTOR POO	L 19-12-1	
ORT	SUMMA	ARY D	Spectr	um name: RE	ACTOR POO	L 19-12-1	
ORT	SUMMA - Avera	ARY O	Spectr	ARY PE	ACTOR POO	L 19-12-1	7.Ani
ORT	SUMMA	ARY O age vity E	Spectr	ARY PE Peak	ACTOR POO	L 19-12-1	7.Án1
ORT	S U M M A - Avera de Activ Bq/L	ARY O age vity E	Spectr F L I B R nergy Acti kev Bq/L	num name: Rf A R Y P E Peak vity Code M	A K U DA Value	оц 19-12-1 S A G E Сомм	essee ENTS
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ORT • Nuclide Nuclide Name Co NR-41	S U M M A - Avera de Activ Bq/L 0.000	ARY 0 age vity E 00E+00	Spectr F L I B R nergy Acti keV Bq/L 293.60 0.000	A R Y P E Peak	ACTOR POO A K U MDA Value 3Q/L .696E+00 0	S A G E COMM	ents
ORT • Nuclide Nuclide Name Co NR-41	S U M M A - Avera de Activ Bq/L 0.000	ARY 0 age vity E 00E+00	Spectr F L I B R nergy Acti kev Bq/L 293.60 0.000 29.78 0.000	A R Y P E Peak vity Code M 	ACTOR POO ADA Value 30/L .696E+00 0 .308E+00 1 .918E+00 1	S A G E COMM	esses ENTS
ORT • Nuclide Nuclide Name Co NR-41	S U M M A - Avera de Activ Bq/L 0.000	ARY 0 age	Spectr F L I B R nergy Acti kev Bq/1 293.60 0.000 293.60 0.000 29.78 0.000 29.46 0.000	ARY PE Peak vity Code M 	ACTOR POO ADA Value 30/L .696E+00 0 .308E+00 1 .918E+00 1 .847E+00 1	SAGE COMM	esses ENTS
ORT Nuclide lame Co R-41	S U M M A - Avera de Activ Bq/L 0.000	ARY 0 age	Spectr F L I B R nergy Acti keV Bq/L 293.60 0.000 29.78 0.000 29.46 0.000 33.60 0.000	ARY PE Peak	EACTOR POO EAK U MDA Value Iq/L .696E+00 0 .308E+00 1 .918E+00 1 .847E+00 1 .425E+00 1	S A G E COMM 0.00E+00 G 00E+03 G 00E+03 G	esses ENTS

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Title <sup>.</sup>	END STATE DI FACILITY	ECOMMISSIONI	NG REPORT FOR	SRC SLOWPO	OKE∙2			

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REACTOR POOL 19-12-17. Rpt

XE-133	6.4276E-01						
			2.935E-01		4.222E-01		
			1.199E-01		1.258E+00		
			0.000E+00		2.062E+00		
			0.000E+00		3.564E-00		
		35.80	8.495E+00	(	1.614E+01	5.79E+01	G
XE-133M	0.00005+00						
AE-133M	0.0000E+00	29 78	0.000E+00	95	1.286E+00	1 005+03	G
			0.000E+00		1.959E+00		
			0.000E+00		1.173E+00		
			0.000E+00		2.948E+00		
			0.000E+00		1.497E+01		
XE-135	0.0000E+00			A			
			0.000E+00		1.938E-01		
			0.000E+00		1.4148-01		
			0.000E+00		1.897E+01		
		30.63	0.000E+00	20	2.679E+01	1.00E+03	6
NA-24	0.0000E+00						
		1368.55	0.000E+00	96	3.534E-01	1.00E+03	G
			0.000E+00		0.000E+00		
BE-7	0.0000E+00						
		477.56	0.000E+00	96	1.6578+00	1.00E+03	G
CR-51	0.0000E+00						-
2		320.07	0.000E+00	96	2.203E+00	1.00E+03	G
-							
ORT	EC q v - i (1215	Env32	G53W4.25	1/1	0/2020 11:	MA 95:39	Page
	y (				REACTOR PI		
Nuclide	Ave activity	Energy	Activity	CO	de Peak MD	A Commen	ts
W-187	1.1676E+00	COF 74	1 3395-00		4 9015 01	2 205-01	<i>c</i>
		479 57	1.238E+00 1.080E+00	22	4.801E-01 1.083E+00	2.29ETU1	G
			5.637E-01		1.660E+00		
			0.000E+00		1.649E+00		
			0.000E+00		1.7578+00		
		59.72	0.000E+00	36	2.335E+00	2.31E+02	G
			0.000E+00		1.877E+00		
			0.000E+00		2.037E+00		
			0.000E+00		4.863E+00		
			0.000E+00		3.586E+00		
			0.000E+00		1.058E+01		
		/1.20	0.000E+00	70	2.026E+01	4.562402	G
MN-54	0.0000E+00						
	0100002100	834.81	0.000E+00	96	4.128E-01	1.00E+03	G
MO-99	0.0000E+00						
			0.000E+00		2.584E-01		
			0.000E+00		1.759E+00		
			0.000E+00		3.387E+00		
			0.000E+00		3.965E+00		
			0.000E+00		4.253E+00		
			0.000E+00		2.330E+01		
			0.000E+00 0.000E+00		1.812E+01 1.966E+01		
		40.30	0.000E.00	3	1.5001-01	1.000103	-
TC-99M	0.0000E+00						
		140.51	0.000E+00	96	4.061E-01	1.00E+03	G
			0.000E+00		1.020E+01	1.00E+03	G
		20.60	0.000E+00	&	6.144E+01		
FE-59	0.0000E+00			0.00			
				Pag	e 4		

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	Nuclear Project#:	655352		Contract#:	255095			Page:	159 of	20
	Customer Doc#:			Customer:	Saskat	chewan I	Research	1 Cour	icil (SRC	)
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			REACTOR PO							
		1291.56 192.34	0.000E+00 9 0.000E+00 9 0.000E+00 9 0.000E+00 9	7.49	2E-01 1 8E+00 1	.00E+03 .00E+03 .00E+03 .00E+03	G			
CO-57	0.0000E+00	136.43	0.000E+00 9 0.000E+00 9 0.000E+00 9	6 1.35	2E <b>+0</b> 0 1	.00E+03 .00E+03 .00E+03	G			
CO-58	0.0000E+00	810 75	0.0005+00		75-01-1	005+03	~			
<u>c</u>		810.75	0.000E+00 4	4.50	/E-UI I	.00E+03	G			
ORTE	Cgv-i (121		G53W4.25 Spectrum nar							
Nuclide	Ave activity	Energy	Activity	Code Pe	ak MDA	Cormen	ts			
CO-60	0.0000E+00		0.000E+00 9 0.000E+00 9			.00E+03				
ZN-65	0.0000E+00									
	0.00002100		0.000E+00 9 0.000E+00 =			.00E+03 .00E+00				
NB-94	0.0000E+00		0.000E+00 9			.00E+03				
ZR-95	0.0000E+00		0.000E+00 9			.00E+03				
NB-95	0.0000E+00						-			
		765.82	0.000E+00 4	4.49	1E-01 1	.00E+03	G			
)-131	0.0000E+00	636.97 284.29 80.18 29.78	0.000E+00 0 0.000E+00 9 0.000E+00 9 0.000E+00 9 0.000E+00 9 0.000E+00 9	2.62 1.82 4.84 1.46	2E+00 1 2E+00 1 3E+00 1 1E+01 1	.00E+03 .00E+03 .00E+03 .00E+03 .00E+03 .00E+03	666			
		29.46	0.000E+00 9	6 2.21	9E+01 1	.00E+03	G			
J-132	0.0000E+00	772.61 954.55 522.65	0.000E+00 9 0.000E+00 9 0.000E+00 9 0.000E+00 9 0.000E+00 9	1.16 3.11 3.37	0E+00 1 1E+00 1 5E+00 1	.00E+03 .00E+03 .00E+03 .00E+03 .00E+03	GGG			
		1398.57 812.20 671.60 669.80 505.90	0.000E+00 9 0.000E+00 9 0.000E+00 8 0.000E+00 9 0.000E+00 9	1.09 1.41 2.61 1.16 1.26	0E+01 1 2E+01 1 8E+01 1 8E+01 1	.00E+03 .00E+03 .00E+03 .00E+03 .00E+03	G G G			
		1136.03 809.80 650.60 1372.07 728.10	0.000E+00 9 0.000E+00 9 0.000E+00 9 0.000E+00 9 0.000E+00 9 0.000E+00 9	2.18 5.07 2.55 3.05 5.05	4E÷01 1 9E+01 1 6E÷01 1 0E+01 1 5E+01 1	.00E+03 .00E+03 .00E+03 .00E+03 .00E+03 .00E+03 .00E+03	66666			
			0.000E+00 9 0.000E+00 8			.00E+03				
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Title:	END STATE DI FACILITY	ECOMMISSIONI	IG REPORT FOR	SRC SLOWPO	OKE-2	

#### REACTOR POOL 19-12-17.Rpt

Nuclide	Ave activity	262.70 1442.56 1143.40 547.10 780.20 1921.08 1290.70 2002.30 1173.20	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	%     3       %     4       %     9       %     9       %     %       %     %       %     %       %     %       %     %       %     %       %     %       %     %	.372E+01 .306E+01 .577E+01 .691E+01 .778E+01 .186E+01 .048E+01 .000E+00 .951E+01	Comment 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	0 0 0 0 0 0 0 0 0 0 0 0	
J-133	0.0000E+00	875.30 1298.90 1237.50 707.40 510.40	0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	%     4.       %     1.       %     1.       %     1.       %     1.       %     6.	.002E+00 .169E+01 .972E+01 .185E+01 .238E+01	1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	6 6 6 6 6 6	
7-T32	0.0000E+00	1131.51 526.56 1678.03 1457.56 1038.76 1791.20 546.56 836.80 1706.46 1124.00 417.63 288.45 220.50 1101.58 1566.41 972.61	0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	%         1.           %         3.4.           %         %      %         % <td>.362E+00 .138E+00 .351E+00 .850E+00 .514E+00 .630E+00 .788E+00 .025E+01 .381E+00 .388E+01 .003E+01 .871E+01 .871E+01 .988E+01</td> <td>1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03</td> <td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td> <td></td>	.362E+00 .138E+00 .351E+00 .850E+00 .514E+00 .630E+00 .788E+00 .025E+01 .381E+00 .388E+01 .003E+01 .871E+01 .871E+01 .988E+01	1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
SR-91	0.0000E+00	1024.30 749.80 652.90 925.80	0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	& 2. % 2. % 2. % 7.	033E+00 679E+00 096E+00 197E+00	1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	6 6 6	
2		652.30	0.000E+00	× 1.	. 3605701	T.OUETUS	6	
ORT	EC g v - i (121		G53W4.25 Spectrum na				Page 17.An1	8
Nuclide	Ave activity	14.90	Activity 0.000E+00 0.000E+00 0.000E+00	% <u>1</u> . % 5.	.430E+01	A Comment 1.00E+03 1.00E+03 1.00E+03	G	
Y-88	0.0000E+00	898.02 14.15	0.000E+00 0.000E+00 0.000E+00 0.000E+00	% 1. & 2.	.721E-01 .395E+00	1.00E+03 1.00E+03 1.00E+03 1.00E+03	G	
Y-91M	0.0000E+00		0.000E+00 0.000E+00		.356E+02	1.00E+03 1.00E+03		
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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESD	R-002	Rev	0
Nuclear Project#:	655352	Contract#:	255095	Page:	161 of	201
Customer Doc#;		ncil (SRC	:)			
Title:	END STATE DE FACILITY	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPO	OKE-2	

			REACTOR P	00L 1	9-12-17.R	ot	
RU-103	0.0000E+00	1.00					
			0.000E+00 0.000E+00		2.401E-01 4.918E+00		
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			0.000E+00 0.000E+00		1.631E-01 2.130E-01		
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			0.000E+00 0.000E+00		1.759E+00 1.007E+00		
			0.000E+00		1.335E+00		
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OR	TEC g v - i (121		G53W4.25 Spectrum n				
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Nuclide	Ave activity		Spectrum n	ame:	REACTOR PO	00L 19-12-	-17.An1
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Nuclide	Ave activity	Energy 537.38 29.96	Activity 0.000E+00 0.000E+00	ame: ا Cod	REACTOR PO e Peak MD/ 1.906E+00 2.608E+00	A Comment 1.00E+03 1.00E+03	-17.Ani ts G
Nuclide	Ave activity	Energy 537.38 29.96 162.64	Activity 0.000E+00 0.000E+00 0.000E+00	ame: ا Codi گ	REACTOR PO e Peak MD/ 1.906E+00 2.608E+00 4.272E+00	1.00E+03 1.00E+03 1.00E+03	-17.Ani ts G G
Nuclide	Ave activity	Energy 537.38 29.96 162.64 304.82	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00	Codi & & %	REACTOR PC e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.387E+00	1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.An1 ts G G G G
Nuclide	Ave activity	Energy 537.38 29.96 162.64 304.82 423.69	Activity 0.000E+00 0.000E+00 0.000E+00	Codi & & %	REACTOR PO e Peak MD/ 1.906E+00 2.608E+00 4.272E+00	1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.An1 ts G G G G G G
Nuclide	Ave activity	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: I Cod	REACTOR PC e Peak MD/ 2.608E+00 4.272E+00 6.387E+00 6.387E+00 6.752E+00 9.973E+00 6.614E+01	A Commen 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.Ån1 ts G G G G G G G G G
Nuclide	Ave activity	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: I Cod	REACTOR PC e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.387E+00 6.752E+00 9.973E+00	A Commen 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.Ån1 ts G G G G G G G G G
Nuclide	Ave activity	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: I Cod	REACTOR PC e Peak MD/ 2.608E+00 4.272E+00 6.387E+00 6.387E+00 6.752E+00 9.973E+00 6.614E+01	A Commen 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.Ån1 ts G G G G G G G G G
Nuclide BA-140	Ave activity 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: I Cod & & & & & % % % % % % % % %	REACTOR P( e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.387E+00 6.387E+00 6.52E+00 9.973E+00 6.614E+01 1.800E+01	A Comment 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.An1 ts G G G G G G G G G G G G
Nuclide BA-140	Ave activity 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: I Cod & & & & & % % % % % % % % % % % %	REACTOR P( e Peak MD/ 2.608E+00 4.272E+00 6.752E+00 6.752E+00 9.973E+00 6.614E+01 1.800E+01 5.946E-01 5.652E-01	A Comment 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.Ăn1 ts G G G G G G G G G G G G G
Nuclide BA-140	Ave activity 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: i Codi & & & & & % % % % % % % % % % % % % %	REACTOR P( e Peak MD/ 2.608E+00 4.272E+00 6.352E+00 9.973E+00 6.522E+00 9.973E+00 6.614E+01 1.800E+01 5.652E-01 8.971E-01	A Comment 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.Ăn1 ts G G G G G G G G G G G G G G G G
Nuclide BA-140	Ave activity 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: i Codi & & & & & % % % % % % % % % % % % % %	REACTOR P( e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.387E+00 6.752E+00 6.614E+01 1.800E+01 5.946E-01 5.946E-01 5.946E-01 5.946E-01 1.401E+00	A Comment 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.Ăn1 ts G G G G G G G G G G G G G G G G G G
Nuclide BA-140	Ave activity 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: 1 Codi & & & & & % % % % % % % %	REACTOR P( e Peak MD/ 2.608E+00 4.272E+00 6.352E+00 9.973E+00 6.522E+00 9.973E+00 6.614E+01 1.800E+01 5.652E-01 8.971E-01	A Comment 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.An1 ts G G G G G G G G G G G G G G G G G
Nuclide BA-140	Ave activity 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25 867.86 8751.79	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: I Codi & & & & % % % % % % % % % % % % % % %	REACTOR PC e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.357E+00 6.357E+00 6.614E+01 1.800E+01 5.946E-01 5.946E-01 5.946E-01 5.946E-01 1.401E+00 3.257E+00 3.962E+00 3.962E+00	A Comment 1.00E+03 1.00E	-17.Ăn1 ts G G G G G G G G G G G G G G G G G G
Nuclide BA-140	Ave activity 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25 867.86 751.79 2521.83	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: Cod & & & & & & & & & & & & & & & & & & &	REACTOR P( e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.387E+00 6.752E+00 6.614E+01 1.800E+01 5.946E-01 5.946E-01 5.946E-01 5.946E-01 3.971E-01 1.401E+00 3.257E+00 3.496E+00 0.000E+00	A Comment 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 0.00E+04 0.00E+04 0.00E+04 0.00E+04 0.00E+05 0.00E	-17.An1 ts G G G G G G G G G G G G G G G G G G
Nuclide BA-140	Ave activity 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25 867.86 751.79 2521.83 432.55	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: 1 Cod	REACTOR P( e Peak MD/ 2.608E+00 2.608E+00 4.272E+00 6.752E+00 9.973E+00 6.514E+01 1.800E+01 5.946E-01 5.652E-01 8.971E-01 1.401E+00 3.962E+00 3.962E+00 3.962E+00 8.743E+00	A Comment 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 0.00E+03 0.00E+03	-17.Ăn1 ts G G G G G G G G G G G G G G G G G G
Nuclide BA-140 LA-140	Ave activity 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25 867.86 751.79 2521.83 432.55	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: 1 Cod	REACTOR PC e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.387E+00 6.752E+00 6.614E+01 1.800E+01 5.946E-01 5.946E-01 5.946E-01 5.946E-01 3.97E+00 3.257E+00 3.496E+00 0.000E+00	A Comment 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 0.00E+03 0.00E+03	-17.Ăn1 ts G G G G G G G G G G G G G G G G G G
Nuclide BA-140	Ave activity 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25 867.86 751.79 2521.83 432.55 919.60	Spectrum n. Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: Cod	REACTOR P( e Peak MD/ 2.608E+00 4.272E+00 6.387E+00 6.752E+00 9.973E+00 6.614E+01 1.800E+01 5.946E-01 5.652E-01 8.971E-01 1.401E+00 3.257E+00 3.257E+00 3.962E+00 3.962E+00 8.743E+00 6.805E+00	A Comment 1.00E+03 1.00E	-17.Ăn1 ts G G G G G G G G G G G G G G G G G G
Nuclide BA-140 LA-140	Ave activity 0.0000E+00 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25 867.86 751.79 2521.83 432.55 919.60 133.53	Spectrum n. Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: Codi & & & & & & & & & & & & & & & & & & &	REACTOR P( e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.352E+00 9.973E+00 6.522E+00 9.973E+00 6.614E+01 1.800E+01 5.946E-01 5.652E-01 8.971E-01 1.401E+00 3.257E+00 3.257E+00 3.262E+00 2.263E+00	A Comment 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03 1.00E+03	-17.Ăn1 ts G G G G G G G G G G G G G G G G G G
Nuclide BA-140 LA-140	Ave activity 0.0000E+00 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25 867.86 751.79 2521.83 432.55 919.60 133.53 36.03	Spectrum n. Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: Codi & & & & & & & & & & & & & & & & & & &	REACTOR P( e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.357E+00 6.372E+00 6.614E+01 1.800E+01 5.946E-01 5.652E-01 8.971E-01 1.401E+00 3.952E+00 3.952E+00 3.96E+00 0.000E+00 8.743E+00 6.805E+00 2.263E+00 6.775E+00	A Comment 1.00E+03	-17. An1 ts G G G G G G G G G G G G G G G G G G
Nuclide BA-140 LA-140	Ave activity 0.0000E+00 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25 867.86 751.79 2521.83 432.55 919.60 133.53 36.03 35.55 80.12	Spectrum n. Activity 0.000E+00	ame: Cod	REACTOR P( e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.352E+00 9.973E+00 6.522E+00 9.973E+00 6.544E+01 1.800E+01 5.946E-01 5.652E-01 8.971E-01 1.401E+00 3.962E+00 3.962E+00 6.805E+00 2.263E+00 6.805E+00 1.312E+01 7.817E+00	A Comment 1.00E+03 1.00E	-17. An1 ts G G G G G G G G G G G G G G G G G G
Nuclide BA-140 LA-140	Ave activity 0.0000E+00 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25 867.86 751.79 2521.83 432.55 919.60 133.53 36.03 35.55 80.12	Spectrum n. Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	ame: Cod	REACTOR P( e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.387E+00 6.52E+00 9.973E+00 6.614E+01 1.800E+01 5.946E-01 5.946E-01 5.952E+01 8.971E-01 1.401E+00 3.257E+00 3.962E+00 0.000E+00 8.743E+00 6.805E+00 2.263E+00 6.755E+00 1.312E+01	A Comment 1.00E+03 1.00E	-17. An1 ts G G G G G G G G G G G G G G G G G G
Nuclide BA-140 LA-140	Ave activity 0.0000E+00 0.0000E+00	Energy 537.38 29.96 162.64 304.82 423.69 437.55 13.85 33.44 1596.20 487.03 815.80 328.75 925.25 867.86 751.79 2521.83 432.55 919.60 133.53 36.03 35.55 80.12	Spectrum n. Activity 0.000E+00	ame: Cod	REACTOR P( e Peak MD/ 1.906E+00 2.608E+00 4.272E+00 6.357E+00 6.372E+00 6.614E+01 1.800E+01 5.946E-01 5.652E+01 8.971E-01 1.401E+00 3.952E+00 3.952E+00 8.743E+00 6.805E+00 2.263E+00 6.775E+00 1.312E+01 7.817E+01	A Comment 1.00E+03 1.00E	-17. An1 ts G G G G G G G G G G G G G G G G G G

			Doc#:	147-01600-ESDR	-002	Rev. 0
	Nuclear Project#:	655352	Contract#.	255095	Page	162 of 201
	Customer Doc#:		Customer	Saskatchewan R	esearch Cour	ncil (SRC)
	Title:	END STATE DEC FACILITY	OMMISSIONII	NG REPORT FOR S	RC SLOWPC	KE-2
CD-109	0.0000E+00		FOR POOL 19-1			
		22.10 0.000 24.95 0.000 88.04 0.000 25.50 0.000	E+00 % 3.8 E+00 & 5.0	47E-01 1.00E+03 ( 28E+00 1.00E+03 ( 71E+00 1.00E+03 ( 54E+01 1.00E+03 (	5	
CE-139	0.0000E+00					
		165.85 0.000 33.44 0.000 33.03 0.000 37.80 0.000 38.70 0.000	E+00 % 5,5 E+00 % 7.6 E+00 % 9.2	89E-01 1.00E+03 ( 28E-01 1.00E+03 ( 03E-01 1.00E+03 ( 22E-01 1.00E+03 ( 34E+00 1.00E+03 (	69.09.09	
HG-203	0.0000E+00	279.17 0.000 72.87 0.000	E:00 % 3.4	65E-01 1.00E+03 ( 22E+00 1.00E+03 (	3	
		10.27 0.000 70.83 0.000		00E+00 0.00E+00 0 20E+00 1.00E+03 0	-	
1			25 4 110 120			
OKT	EC G V - 1 (12)	L5) ENV32 G53W4 Spectr		CTOR POOL 19-12-	Page 10 17.Ani	
Nuclide	Ave activity	Energy Acti 82.50 0.000		eak MDA Comment: 84£+00 1.00E+03 (		
K-40	0.0000E+00	1460.75 0.000	E+00 % P 8.9	48E+00 2.40E+01 0	3	
SB-124	0.0000E+00	602.71 0.000 1691.04 0.000 722.78 0.000 645.84 0.000 2091.20 0.000 1368.21 0.000 1045.12 0.000 1045.12 0.000 1325.53 0.000 709.34 0.000 1436.60 0.000	E+00 % 5.3 E+00 % 1.4 E+00 % 1.4 E+00 % 3.8 E+00 % 9.0 E+00 % 1.0 E+00 % 1.6 E+00 % 1.5 E+00 % 1.5	62E-01 1.00E+03 0 97E-01 1.00E+03 0 20E+00 1.00E+03 0 20E+00 1.00E+03 0 20E+00 1.00E+03 0 71E+00 1.00E+03 0 21E+00 1.00E+03 0 61E+01 1.00E+03 0 55E+01 1.00E+03 0 04E+01 1.00E+03 0		
S8-125	0.0000E+00	427.95 0.000 600.77 0.000 636.15 0.000 463.51 0.000 176.29 0.000 035.46 0.000 606.82 0.000 671.66 0.000 380.51 0.000 81.80 0.000	E+00 % 5.8 E+00 % 1.0 E+00 % 1.4 E+00 & 3.3 E+00 % 5.5 E+00 % 3.4 E+00 % 2.2 E+00 % 1.7	24E+00 1.00E+03 ( 72E-01 1.00E+03 ( 36E+00 1.00E+03 ( 36E+00 1.00E+03 ( 36E+00 1.00E+03 ( 28E+00 1.00E+03 ( 96E+01 1.00E+03 ( 36E+01 1.00E+03 ( 02E+01 1.00E+03 (		
SE-75	0.0000E+00	10.53 0.000 279.53 0.000 121.12 0.000 400.65 0.000	E+00 % 2.5 E+00 = 0.0 E+00 & 7.7 E+00 % 1.3 E+00 % 1.6 E+00 % 2.8 E+00 % 1.7	37E-01 1.00E+03 0 56E-01 1.00E+03 0 00E+00 0.00E+03 0 97E-01 1.00E+03 0 52E+00 1.00E+03 0 00E+00 0.00E+03 0 48E+00 1.00E+03 0 53E+00 1.00E+03 0	2	
EU~152	0.0000E+00	40.12 0.000 121.78 0.000		21E+00 1.00E+03 ( 86E-01 1.00E+03 (		

				[	Doc#	47-01600-E	SDR-002	Rev: 0
	Nuclear Project#	655352		Cont	ract#: 2	55095	Pa	ge: 163 of 20
	Customer Doc#:			Custo	omer: S	askatchew	an Research C	ouncil (SRC)
	Title:	END ST FACILI		MMISSI	ONING	REPORT F	OR SRC SLOW	/POKE-2
5			REACTOR P 0.000E+00 0.000E+00	% 4.	495E-0	Rpt 1 1.00E+03 0 1.00E+03	-	
	ТЕС g v - i (1219					:58:39 AM POOL 19-12	Page 11 -17.Ani	
Nuclide	Ave activity	964.00 1112.07 778.90 1085.80 244.67 867.39 444.00 411.09 46.60 1089.82 1299.19	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	%         1.1           %         3.2           %         1.2           &         3.4           %         1.2           &         3.4           %         1.2           %         1.2           %         1.2           %         1.2           %         1.2           %         1.2           %         1.2           %         1.2	661E+0 520E+0 547E+0 590E+0 038E+0 055E+0 055E+0 064E+0 600E+0 327E+0 117E+0 301E+0	DA Comment 0 1.00E+03 0 1.00E+03 0 1.00E+03 0 1.00E+03 0 1.00E+03 0 1.00E+03 0 1.00E+03 1 1.00E+03 1 1.00E+03 1 1.00E+03 1 1.00E+03 1 1.00E+03	ତ ତ ତ ତ ତ ତ ତ ତ ତ ତ ତ	
RA-226	0.0000E+00						d Ave Activit	У
U-235	1.1699E+00	185.99	0.000E+00	} P 8.0	638E+0	0 1.00E+03	G	
		143.76 205.31 163.35 93.35 109.14 89.96 202.12	4.006E-01 7.891E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 3.835E+00 0.000E+00 0.000E+00	?( 1.1 7. 6.1 1.0 % 1.0 ?( 9.1 % 1.1	896E+0 457E-0 529E-0 081E+0 099E+0 885E+0 267E+0	1 2.87E+01 0 9.17E+01 1 0.00E+00 0 0.00E+00 0 1.46E+02 0 8.00E+01 1 2.52E+02 0 0.00E+00	0 0 0 0 0 0 0	
TE-132	0.0000E+00	228.16	0.000E+00	& 2.	188E-0	1 1.00E+03	G	
		28.50 49.72 32.30 116.30	0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	% 3 & 1.: % 2.0 % 7.0	488E-0 372E+0 097E+0 075E+0	1 1.00E+03 0 1.00E+03 0 1.00E+03 0 1.00E+03 1 1.00E+03	6 6 6	
MO-90	0.00002+00	257 24	0.000E+00	8. E (	0885-0	1 1.00E+03	6	
		16.60 122.37 18.60 203.13 323.20 445.37 162.93	0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	* 2. * 4. * 9. * 2. * 6. * 4. * 6.	417E+0 492E-0 615E+0 144E+0 102E+0 827E+0 122E+0	0 1.00E+03 1 1.00E+03 0 1.00E+03 0 1.00E+03 0 1.00E+03 0 1.00E+03 0 1.00E+03 0 1.00E+03	ର ଜ ଜ ଜ ଜ ଜ ଜ	
<del>1</del>		941.50	0.000E+00	% 5.0	076E+0	0 1.00E+03	G	
ORT	ΈC g V - i (1219					:58:39 AM POOL 19-12		
Nuclide	Ave activity	42.70 1454.60 1387.40 472.24	Activity 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00	%     1.       &     1.       %     2.       %     2.       %     2.       %     4.	285E+0 595E+0 152E÷0 077E+0 196E÷0	DA Commen 1 1.00E+03 1 1.00E+03 1 1.00E+03 1 1.00E+03 1 1.00E+03 1 1.00E+03 1 1.00E+03	6 6 6 6	
ZR-97	0.0000E+00							

			Doc#:	147-01600-ESD	R-002	Rev 0
	Nuclear Project#.	655352	Contract#:	255095	Page:	164 of 201
	Customer Doc#:		Customer	Saskatchewan	Research Cou	ncil (SRC)
	Title:	END STATE DEC FACILITY	OMMISSIONII	NG REPORT FOR	R SRC SLOWPO	DKE-2
		743.36 0.000 507.63 0.000 1147.95 0.000 355.39 0.000 1021.30 0.000 602.41 0.000 1750.46 0.000	E+00 % 4.7 E+00 & 2.4 E+00 % 1.6 E+00 % 1.9 E+00 % 2.0 E+00 % 2.4 E+00 % 2.4 E+00 % 2.4 E+00 % 1.0	12-17.Rpt 162E-01 1.00E+0 164E+01 1.00E+0 113E+01 1.00E+0 145E+01 1.00E+0 145E+01 1.00E+0 128E+01 1.00E+0 126E+01 1.00E+0 191E+01 1.00E+0 100E+0	3 G 3 G 3 G 6 G 3 3 G 6 G 3 3 G 3 3 G 3 6 G 3 3 G	
18-97	0.0000E+00	657.92 0.000 1024.53 0.000		98E+00 1.00E+0 01E+02 1.00E+0		
SR-85	0.0000E+00	513.99 0.000 13.38 0.000 15.00 0.000	E+00 % 2.7	55E-01 1.00E+0 74E+00 1.00E+0 22E+00 1.00E+0	3 G	
RH-106	0.0000E+00	621.80 0.000 1050.10 0.000		37 <del>E+</del> 00 1.00E+0 83E+01 1.00E+0		
5N-113	0.0000E+00	391.71 0.000 24.21 0.000 24.00 0.000 27.30 0.000 27.90 0.000 255.04 0.000	E+00 % 1.3 E+00 % 2.8 E+00 % 3.0 E+00 & 1.5	46E-01 1.00E+0 47E+00 1.00E+0 67E+00 1.00E+0 97E+00 1.00E+0 83E+01 1.00E+0 53E+00 1.00E+0	3 G 3 G 3 G 3 G	
d-113M I: ( - This	0.0000E+00 peak used i	263.70 0.000 n the nuclide ac		73E÷04 1.00E+0 ge.	3 G	
! - Peak nega	is part of tive during	, but only one p a multiplet and deconvolution. 15) Env32 G53W4 Spectn	.25 1/10/20	nt		
<ul> <li>Peak</li> <li>Peak</li> <li>Peak</li> <li>Fail</li> <li>Peak</li> <li>Peak</li> <li>Peak</li> <li>Peak</li> <li>Calc</li> <li>Tibr</li> <li>Peak</li> <li>Peak</li> <li>Peak</li> </ul>	fails sensi identified, ed one or mo activity hi activity lo outside ana ulated peak ary energy co background s	at FW25M, but of tivity test. but first peak of re qualification gher than countin wer than countin ver than countin lysis energy ran centroid is not of entroid for posi- ubtraction e to another for	of this nucl tests. ng uncertain g uncertaint ge. close enough tive identif	ty range. y range. to the ication.		
F - Fast I - Fiss N - Natu P - Phot C - Char M - No M	Codes: mal Neutron Act ion Product rally Occurr on Reaction ged Particle DA Calculation cidence Corr	Activation ivation ing Isotope Reaction on	Peak Codes: 5 - Gamma Ra X - X-Ray P - Positron 5 - Single-E 0 - Double-E K - Key Line A - Not in A	Decay scape scape		

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Nuclear Project#:	655352	Contract#.	255095	Page:	165 of	201
Customer Doc#:		Customer:	Saskatchewan	Research Cour	ncil (SRC	)
Title	END STATE DE FACILITY	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPO	OKE-2	

REACTOR POOL 19-12-17.Rpt

Nuclide			OFNUCLI Time Corrected Activity		SAMPLE 2 Sigma Total	MDA
		Bq/L	Bq/L	Bq/L	Bq/L	
AR-41	<	5.9297E-01	1.6963E+00			
XE-131M	<	1.2995E+00	1.3083E+00			
XE-133		6.3310E-01	6.4276E-01	4.9465E-01	4.9645E-01	4.222E-01
XE-133M	<	1.2409E+00	1.2857E+00			
XE-135	<	1.5683E-01	1.9382E-01			
NA-24	<	3.1098E-01	3.5344E-01			
BE-7	<	1.6540E+00	1.6565E+00			
CR-51	<	2.1964E+00	2.2028E+00			
W-187	-	1.0773E+00	1.1676E+00	5.35748-01	5.4097E-01	4.SOLE-01
MN-54	<	4.1272E-01	4.1283E-01			
MO-99	<	2.5104E-01	2.5844E-01			
TC-99M	<	2.9502E-01	4.0608E-01			
FE-59	5	6.1016E-01 2.1571E-01	6.1124E-01 2.1578E-01			
CO-57 CO-58	<	4.5017E-01	4.5068E-01			
CO-60	× ×	2.2637E-01	2.2638E-01			
ZN-65	2	9.1392E-01	9.1422E-01			
NB-94	<	2.7998E-01	2.7998E-01			
ZR-95	<	4.4601E-01	4.4657E-01			
NB-95	<	4.4808E-01	4.4910E-01			
3-131	<	2.9780E-01	3.0078E-01			
OR	TEC	y - i (1215			0 11:58:39 AM	Page 14 -17.Ani
J-132 J-133	~~	1.7968E-01 2.1595E-01	4.0317E-01 2.3741E-01			
1-135	2	2.7342E+00	3.6577E+00			
SR-91	2	4.9340E-01	6.0198E-01			
Y-88	<	2.8662E-01	2.8684E-01			
Y-91M	<	7.9209E-01	8.0733E+00			
RU-103	<	2.3961E-01	2.4010E-01			
CS-134	<	1.6305E-01	1.6307E-01			
CS-136	<	3.3544E-01	3.3752E-01			
CS-137	#	1.3912E+00	1.3912E+00	5.3764E-01	5.4496E-01	4.762E-01
			1.9060E+00			
	<	1.8940E+00				
BA-140 LA-140	<	5.6682E-01	5.9455E-01			
BA-140 LA-140 CE-144	~~	5.6682E-01 2.2627E+00	5.9455E-01 2.2634E+00			
BA-140 LA-140 CE-144 CD-109	VVV	5.6682E-01 2.2627E+00 3.0469E-01	5.9455E-01 2.2634E+00 3.0474E-01			
BA-140 LA-140 CE-144 CD-109 CE-139	~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01			
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203	~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01			
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203 K-40	~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00			
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203 K-40 SB-124	~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00 3.7572E-01	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01			
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203 K-40 SB-124 SB-125	~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00 3.7572E-01 1.3239E+00	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00			
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203 K-40 SB-124 SB-125 SE-75	~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00 3.7572E-01 1.3239E+00 3.2345E-01	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00 3.2366E-01			
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203 K-40 SB-124 SB-124 SB-125 SE-75 EU-152	~~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00 3.7572E-01 1.3239E+00 3.2345E-01 1.0211E+00	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00 3.266E-01 1.0211E+00			
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203 K-40 SB-124 SB-125 SB-125 SE-75 EU-152 RA-226	~~~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00 3.7572E-01 1.3239E+00 3.2345E-01 1.0211E+00 8.6385E+00	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00 3.2366E-01 1.0211E+00 8.6385E+00	1,42415+00	1.4268E+00	1.896E+00
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203 K-40 SB-124 SB-125 SE-75 EU-152 RA-226 U-235	~~~~~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00 3.7572E-01 1.3239E+00 3.2345E-01 1.0211E+00	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00 3.2366E-01 1.0211E+00 8.6385E+00 1.1699E+00	1.4241E+00	1.4268E+00	1.896E+00
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203 K-40 SB-124 SB-125 SE-75 EU-152 EU-152 RA-226 U-235 TE-132	~~~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.280E-01 2.3613E-01 8.9477E+00 3.7572E-01 1.3239E+00 3.2345E-01 1.0211E+00 8.6385E+00 1.1699E+00	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00 3.2366E-01 1.0211E+00 8.6385E+00	1.4241E+00	1.4268E+00	1.896E+00
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203 K-40 SB-124 SB-124 SB-125 SE-75 EU-152 RA-226 U-235 TE-132 MO-90	~~~~~~~~~~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.280E-01 2.3613E-01 8.9477E+00 3.7572E-01 1.3239E+00 3.2345E-01 1.0211E+00 8.6385E+00 1.1699E+00 2.1344E-01	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00 3.2366E-01 1.0211E+00 8.6385E+00 1.1699E+00 2.1877E-01	1.4241E+00	1.4268E+00	1.896E+00
BA-140 LA-140 CE-144 CE-139 HG-203 K-40 SB-124 SB-125 SE-75 EU-152 RA-226 U-235 TE-132 TE-132 ZR-97	~~~~~~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00 3.7572E-01 1.3239E+00 3.2345E-01 1.0211E+00 8.6385E+00 1.1699E+00 2.1344E-01 3.6239E-01 1.8388E-01 7.5599E-01	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00 3.2366E-01 1.0211E+00 8.6385E+00 1.1699E+00 2.1877E-01 5.0876E-01	1.4241E+00	1.4268E+00	1.896E+00
BA-140 LA-140 CE-144 CD-109 CE-139 HG-203 K-40 SB-124 SB-125 SE-75 EU-152 RA-226 U-235 TE-132 MO-90 NB-97	~~~~~~~~~~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00 3.7572E-01 1.3239E+00 3.2345E-01 1.0211E+00 8.6385E+00 1.1699E+00 2.1344E-01 3.6239E-01 1.8388E-01	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00 3.2366E-01 1.0211E+00 8.6385E+00 1.1699E+00 2.1877E-01 5.0876E-01 2.0618E-01	1.4241E+00	1.4268E+00	1.896E+00
BA-140 LA-140 CE-144 CE-149 HG-203 K-40 SB-124 SB-125 SE-75 SE-75 SE-75 SE-75 RA-226 U-235 TE-132 MO-90 ZR-97 NB-97 NB-97 SR-85	~~~~~~~~~~~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00 3.7572E-01 1.3239E+00 3.2345E-01 1.0211E+00 8.6385E+00 1.1699E+00 2.1344E-01 3.6239E-01 1.8388E-01 7.5599E-01	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00 3.2366E-01 1.0211E+00 8.6385E+00 1.1699E+00 2.1877E-01 5.0876E-01 2.0618E-01 3.5976E+00	1.4241E+00	1.4268E+00	1.896E+00
BA-140 LA-140 CE-144 CC-109 CE-139 HG-203 K-40 SB-124 SB-125 SE-75 EU-L52 RA-226 U-235 TE-132 WO-90 ZR-97 NB-97 SR-85 RH-106 SN-113	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	5.6682E-01 2.2627E+00 3.0469E-01 1.2880E-01 2.3613E-01 8.9477E+00 3.2345E-01 1.0211E+00 8.6385E+00 1.1699E+00 2.1344E-01 3.6239E-01 1.8388E-01 7.5599E-01 2.6515E-01 2.0365E+00 4.0429E-01	5.9455E-01 2.2634E+00 3.0474E-01 1.2888E-01 2.3654E-01 8.9477E+00 3.7622E-01 1.3240E+00 3.2366E-01 1.0211E+00 8.6385E+00 1.1699E+00 2.1877E-01 3.5976E+00 2.6547E-01 2.0369E+00 4.0457E-01	1.4241E+00	1.4268E+00	1.896E+00
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		Doc#:	147-01600-ESD	R-002	Rev:	0	
Nuclear Project#:	655352	Contract#:	255095	Page:	166 of	201	
Customer Doc#:	Customer: Saskatchewan Research Council (SRC)						
Title:	END STATE D	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPO	OKE-2		

REACTOR POOL 19-12-17.Rpt
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded
Tabal Activity ( 202 1 to 1006 4 kov) ( 2725.00 80/
Total Activity ( 202.1 to 1996.4 kev) 4.272E+00 Bq/L Total Decayed Activity ( 202.1 to 1996.4 kev) 4.3714867E+00 Bq/L
istal becayes activity ( 2011 to 1) but a key 4.51 100 retor baye
Analyzed by:
DC
15 John
Reviewed by:
Supervisor

Laboratory:

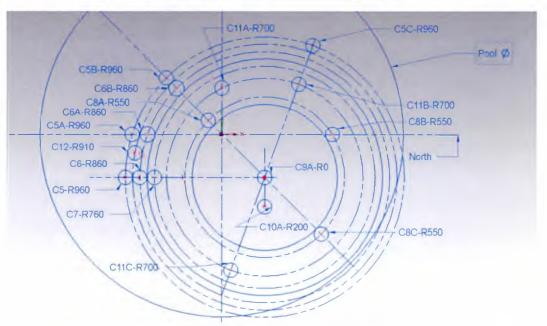
Page 12

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

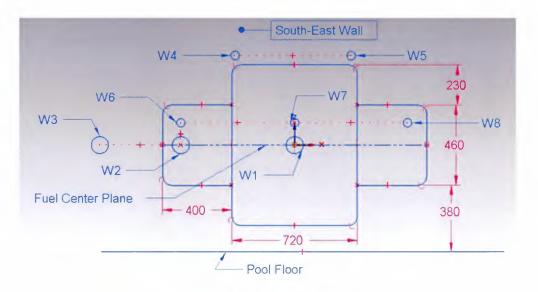
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		Doc#:	147-01600-ESDR-002	2	Rev.	0	
Nuclear Project#.	655352	Contract#.	255095	Page:	167 of	201	
Customer Duc#:	Customer: Saskatchewan Research Council (SRC)						
Title.	END STATE DE FACILITY	ECOMMISSIONIN	IG REPORT FOR SRC	SLOWPO	OKE-2		

Appendix H REACTOR POOL SAMPLING PLAN



Pool Floor Sampling Plan



## Pool Wall Sampling Plan

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDI	R-002	Rev:	0
Nuclear Project#:	655352	Contract#:	255095	Page:	168 of	201
Customer Doc#:		Customer:	Saskatchewan I	Research Cour	ncil (SRC	)
Title:	END STATE D	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPC	KE-2	

Appendix I IRRADIATED CONCRETE IN DRUMS – GAMMA SPEC

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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		Doc#:	147-01600-ESDR-002		Rev	0
Nuclear Project#:	655352	Contract#:	255095	Page:	169 of 2	201
Cuslomer Doc#:		Customer.	Saskatchewan Resear	ch Cour	ncil (SRC)	
Title:	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FOR SRC S	LOWPC	KE-2	

From:	Rees, Philip
To:	Tanguay, Piente (CNSC/CCSN); Erdebil, Ismail (CNSC/CCSN)
Ca	Alim, Shahzad; Chomey, Dave
Subject:	RE: Decommissioning Inspection of the SRC SLOWPOKE-2 Facility Held July 8-10, 2020
Date:	Thursday, October 1, 2020 10:36:49 AM
Attachments:	Concrete Waste Barrels - Revised Report 2020-9657.pdf

Good Morning Pierre & Ismail -

Related to the non-compliance noted in the decommissioning inspection report, SRC did characterize and measure the concrete waste in the barrels in anticipation of disposal through CNL. The table below provides the readings of the barrels on contact and at a distance of 1 meter.

		RP Readings (nrrent/hr)			
	Weight (kg)	Near Contact	@ 1m		
Drum 1	325	0.01	0.01		
Drum 2	325	0.01	0.01		
Drum 3	325	0.01	0.01		
Drum 4	325	0.02	0.00		
Drum 5	325	0.01	0.01		
Drum 6	325	0.02	0.01		

In addition, samples were taken from the concrete waste and analyzed via gamma spectroscopy, and these results indicate the various radionuclides present in the waste. The report is attached for reference.

The waste is being prepared for shipment and disposal with CNL, with an anticipated ship date no later than 30 OCT 2020.

Once the shipment has been approved and completed, a final email will be sent indicating the completion of remediation activities related to the non-compliance.

Kind regards,

Philip

From: Holbrook, Ailan (CNSC/CCSN) <ailan.holbrook@canada.ca> Sent: Tuesday, September 22, 2020 2:25 PM

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDR-	002	Rev	0
Nuclear Project#:	655352	Contract#:	255095	Page:	170 of	201
Customer Doc#:		Customer:	Saskatchewan Re	esearch Cour	ncil (SRC)	
Title:	END STATE DE FACILITY	ECOMMISSIONIN	IG REPORT FOR S	RC SLOWPO	OKE-2	

To: Chorney, Dave <Dave.Chorney@src.sk.ca>

Cc: Ducros, Caroline (CNSC/CCSN) <caroline.ducros@canada.ca>; Tanguay, Pierre (CNSC/CCSN) <pierre.tanguay@canada.ca>; Erdebil, Ismail (CNSC/CCSN) <ismail.erdebil@canada.ca>; Alim, Shahzad <Shahzad.Alim@snclavalin.com>; Rees, Philip <Philip.Rees@src.sk.ca>

Subject: Decommissioning Inspection of the SRC SLOWPOKE-2 Facility Held July 8-10, 2020

CAUTION: This email is from an external source. Do not click links or open attachments unless you recognize the sender and know the content is safe.

2020-09-22

Subject: Decommissioning Inspection of the SRC SLOWPOKE-2 Facility Held July 8-10, 2020

Dear Mr. Chorney,

Please find attached a letter and report from Mr. Erdebil (CNSC) concerning the subject line above. Kindly note that no paper copy will follow.

Thank you,

### Ailan Holbrook

Administrative Assistant | Adjointe administrative Nuclear Processing Facilities Division | Division des installations de traitement nucléaires Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire ailan.holbrook@canada.ca

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#	147-01600-ESDF	8-002	Rev:	0
Nuclear Project#:	655352	Contract#:	255095	Page:	171 of	201
Customer Doc#:		Customer:	Saskatchewan F	Research Cour	ncil (SRC)	)
Title:	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FOR	SRC SLOWPC	OKE-2	

SIC SASMATCHEWAN

Environmental Analytical Laboratories 143-111 Research Drive. Saskatoon, SK Canada S7N 3R2

T: 306-933-6932 F: 306-933-7922 Toll-free: 1-800-240-8808 E: analytical@src.sk.ca

www.src.sk.ca/analytical

Revised

SRC Group # 2020-9657

Oct 05, 2020

Analytical. SRC 143-111 Research Drive Saskatoon. SK S7N 3R2 Attn: Dave Chorney. 11526

Date Samples Received: Aug-19-2020

Client P.O.:

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 4 authorized by Vicky Snook, Supervisor

\* Test methods and data are validated by the laboratory's Quality Assurance Program.

\* Routine methods follow recognized procedures from sources such as

- \* Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
- \* Environment Canada
- \* US EPA
- \* CANMET

\* The results reported relate only to the test samples as provided by the client.

\* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

\* Additional information is available upon request.

\* Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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				Doc#:	147-01600-ES		Rev: 0
		Nuclear Project#.	655352	Contract#:	255095	Pag	e: 172 of 201
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143-111 R Saskatoon Attn: Da Date Samples 40037 40038	esearch Driv SK S7N 3 ve Chorney, Received: A 08/19/2020 08/19/2020	BR2 11526 Aug-19-2020 BARREL 5 Co BARREL 5 Co BARREL 5 Co	ONCRETE #1 *0	CONCRETE* CONCRETE* CONCRETE*	O.: 0037	40038	Oct 05, 2020 40039
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<0.003

0.48

<0.005

0.62

<0.003

0.61

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Bq/g

**B**q/g

Note for Sample # 40039

Zino-65

Potassium-40

Revised report to correct the Europium 152 result. Sept 1/20 VS

The temperature of the cooler was 24.4 °C upon receipt.

Results are reported on an as received basis. Gamma spectroscopy detection limits are influenced by several factors. "Less than" values reported above represent the lowest detection limits achievable for the sample.

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDI	R-002	Rev 0
Nuclear Project#:	655352	Contract#.	255095	Page:	173 of 201
Customer Doc#.		Customer:	Saskatchewan I	Research Cour	ncil (SRC)
Title:	END STATE DE FACILITY	COMMISSIONIN	IG REPORT FOR	SRC SLOWPC	DKE-2



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www.src.sk.ca/analytical

Revised

SRC Group # 2020-9657

Oct 05, 2020

Analytical, SRC

40040 08/19/2020 BARREL 1 CONCRETE SLURRY #6 \*CONCRETE\*

Analyte	Units	40040	
Lab Section 4			
Europium-152	Bq/g	0.095	
Europium-154	Balg	0.01	
Scandium-46	Balg	<0.002	
Cesium-134	Bq/g	0.004	
Cesium-137	Bq/g	0.048	
Cobalt-80	Ba/g	0.071	
Iron-59	Bq/g	<0.004	
Manganese-54	Bq/g	0.012	
Zinc-65	Bq/g	<0.002	
Potassium-40	Bq/g	0.47	

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 40040 Revised sample description. 10/5/20 TG

The temperature of the cooler was 24.4 °C upon receipt.

Results are reported on an as received basis. Gamma spectroscopy detection limits are influenced by several factors. "Less than" values reported above represent the lowest detection limits achievable for the sample.

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#_	147-01600-ESDF	R-002	Rev.	0
Nuclear Project#:	655352	Contract#.	255095	Page	174 of	201
Customer Doc#:		Customer	Saskatchewan F	Research Cour	ncil (SRC	)
Title:	END STATE DI FACILITY	ECOMMISSIONII	NG REPORT FOR	SRC SLOWPO	DKE-2	
1/2		ental Analytical ch Drive. Saskatoon.	Laboratories SK Canada S7N 3R2	T: 306-933-6932 Toll-free: 1-800-7 E: analytical@sr	240-8808	7922
			·····	www.src.sk.ca/a	nalytical	

# Revised

SRC Group # 2020-9657

Oct 05, 2020

Analytical, SRC

### Analyte Methods

Name	Units	Method	
Cobalt-80	Bq/g	Rad-300	
Cesium-134	Balg	Rad-300	
Cesium-137	Bq/g	Rad-300	
Europium-152	Balg	Rad-300	
Europium-154	Balg	Rad-300	
Iron-59	Bq/g	Rad-300	
Potassium-40	Bq/g	Rad-300	
Manganese-54	Balg	Rad-300	
Scandium-46	Bq/g	Rad-300	
Zino-65	Balg	Rad-300	

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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Nuclear Project#:	655352	Contract#:	255095	Page:	175 of	201
Customer Doc#:		Customer.	Saskatchewan I	Research Cour	ncil (SRC)	)
Title:	END STATE D	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPC	)KE-2	

## Appendix J UNCONDITIONAL RELEASED ITEMS

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#.	147-01600-ESD	R-002	Rev	0
Nuclear Project#:	655352	Contract#:	255095	Page	176 of	201
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Title:	END STATE DE	COMMISSIONIN	IG REPORT FOR	SRC SLOWPC	OKE-2	

SNC · LAVAL	IN				- Proprietary
Unconditiona NU-B10011-FM-001 Rev	Release For	m		Ref Proc	Page 1 of 2 educe NU 910011-PRO-009
		Fil	ie No ·	NU-910011-0	35-000
Section A: Validit	y Information				
2 CAPSO	ulpment or Material ULE RECEIN DIATION CO.		Identification Numbe	r (crate or tool): N/A QUICE BOX	
FOR RMC	1 TRAK	ATION CON DIATION CON SELVICE BOD	ONTROLLER	" CAPSULL	KELE VER
	orc.	SLOWPOKE	incient?		
Section B: Radio	ogical Assessment				
	ogical Assessment	upment or material at	any time been		
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To the best of your k Cunter Used or	nowlerige, has the equ	uipment or material at	/es 🛛 No /es 🗍 No		
To the best of your k Cunter Used or	nowlerige, has the equi sinated? r stored in a containin	uipment or material at	/es 🛛 No /es 🗌 No	(f Yes, 100 cm/ sample: Survey Jostrument	Net Counts = Gross-Background (cpm)
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Candu Energy Inc. and EHC-Lavalin Histoar Inc.

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDR-002		Rev: 0
Nuclear Project#.	655352	Contract#:	255095	Page:	177 of 20
Customer Doc#:		Customer:	Saskatchewan Resear	ch Cou	ncil (SRC)
Title:	END STATE DE	COMMISSIONIN	IG REPORT FOR SRC S	LOWPO	DKE-2

### **Unconditional Release Form**

NU-910011-FM-001 Rev 4

Page 2 of 2 Ref Procedure NU-910011-PRO-009

FNo, provide itetails:       All accessible ands checked - not inside capsyle receiver or parts of the state of the stat
If No, provide details: All ACCESSIBLE ARAS Checked - Not inside Capsvile receiver or parts of the second
For item(s) placed in SAM, did it "Clear" the SAM? Yes No If No, provide details: tr/a (no SAM on site) For items do not fit in the Small Article Monitor (SAM) Did large area Masslinn(s) cleared the SAN? Yes No If No, provide details: n/a (no SAM on site) Was the gamma dose rate measured below background? Yes No If No, provide details: Group 1 Radiation Printection Surveyor: Crice surveys are completed by Mathanian Protection and veyor, Equipment of white the intest perfemated Tom Radiation Area immediately after the item[s) have been approved for removal. Date: Section D: Health Physicist and Radiation Protection Program Authority Approval Table 1: Maximum Surveyed Values for Unrestricted Use Maximum Values for Unrestricted itse.
For item(s) placed in SAM, did it "Clear" the SAM? Yes No If No, provide details: tr/a (no SAM on site) For items do not fit in the Small Article Monitor (SAM) Did large area Masslinn(s) cleared the SAN? Yes No If No, provide details: n/a (no SAM on site) Was the gamma dose rate measured below background? Yes No If No, provide details: Group 1 Radiation Printection Surveyor: Crice surveys are completed by Mathanian Protection and veyor, Equipment of white the intest perfemated Tom Radiation Area immediately after the item[s) have been approved for removal. Date: Section D: Health Physicist and Radiation Protection Program Authority Approval Table 1: Maximum Surveyed Values for Unrestricted Use Maximum Values for Unrestricted itse.
For Items do not fit in the Small Article Monitor (SAM)         Did large area Masslinn(s) cleared the SAM?       Yes       No       If No. provide details; n/a (no SAM on site)         Was the gamma dose rate measured below background?       Yes       No       If No. provide details;         Group 1 Radiation       Protection Surveyor:       If No. provide details;       Date:         Croce surveys are completed by standard Protection Surveyor, repriment or where the intest be removed for removal.       Date:         Section D: Health Physicist and Radiation Protection Program Authority Approval.       Table 1: Maximum Surveyed Values for Unrestricted Use       Table 2: Maximum Values for Unrestricted Hse.
Was the gamma dose rate measured below background?       Yes       No       If No, provide details:         Group 1 Radiation Protection Surveyor:       Crice surveys are completed by Radiation Protection Surveyor, Equipment of white the intest be removed from Radiation Area immediately after the item[s] have been approved for removal.       Date:         Section D: Health Physicist and Radiation Protection Program Authority Approval Table 1: Maximum Surveyed Values for Unrestricted Use       Table 2: Maximum Values for Unrestricted Use
Was the gamma dose rate measured below background?       Yes       No       If No, provide details:         Group 1 Radiation Protection Surveyor       Chice surveys are completed by Radiation Protection Surveyor, Equipment of white the intest be removed from Radiation Area immediately after the item[s] have been approved for removal.       Date:         Section D:       Health Physicist and Radiation Protection Program Authority Approval.       Date:         Table 1:       Maximum Surveyed Values for Unrestricted Use       Table 2: Maximum Values for Unrestricted Use
Group 1 Radiation Protection Surveyor: Citice surveys are completed by Radiation Protection surveyor, Equipment of Materia Intest performance Date: Section D: Health Physicist and Radiation Protection Program Authority Approval Table 1: Maximum Surveyed Values for Unrestricted Use Surface Articity Maximum Value
Protection Surveyor: Citice surveys are completed by National Protection Surveyor, Equipment of Waterian must be removed Date: Tom Radiation Area immediately after the item(s) have been approved for removal. Date: Section D: Health Physicist and Radiation Protection Program Authority Approval Table 1: Maximum Surveyed Values for Unrestricted Use Surface Artisity Maximum Value
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Section D: Health Physicist and Radiation Protection Program Authority Approval Table 1: Maximum Surveyed Values for Unrestricted Use Surface Artisity Maximum Value
Section D: Health Physicist and Radiation Protection Program Authority Approval Table 1: Maximum Surveyed Values for Unrestricted Use Surface Activity Maximum Value
Table 1: Maximum Surveyed Values for Unrestricted Use Table 2: Maximum Values for Unrestricted Use Maximum Value
(Bg/cm <sup>2</sup> ) Raison Croe (eq/cm <sup>2</sup> )
Total Removable
B/y emitters 3.0 0.3
Removable Ø
a emitters. Total 0.002 a emitters 0.3 0.03
Removable

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			Doc#:	147-01600-ESDR	-002 Rev:
	Nuclear Project#:	655352	Contract#:	255095	Page: 178 of 2
	Customer Doc#		Customer.	Saskatchewan R	esearch Council (SRC)
	Title:	END STATE	DECOMMISSIONIN	IG REPORT FOR S	RC SLOWPOKE-2
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ncondition	al Release Form			Ref Prace	Page 1 of 2 dure NU-St0011-PRO-009
		1 3	File No.:	NU-910011-03	5-000
ection A: Validi	ity information				
	quipment or Material: nling coil + control rod mo	tor cover	Identification Numbe	r (crate or tool): N/A	
Reason for Requ	iest: For disposal of items				
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	Title:	END STATE D FACILITY	DECOMMISSIONI	NG REPORT F	OR SRC SLOWPOKE-2
Inconditional I J-910011-FM-001 Rev. 4				R	Page 2 of 2 of Procodute NU-\$10011-PRO-009
ection C: Radiolog as any additional mor unting?	feal of fails	as tritium samples	s, gamma spertroscop	er laquid scinti	llation 🗌 Yes 🛛 No
fes, give details or att	ach results of analyse	s: n/a			
ere all of the exterior No, provide details: ii,	and Interior surfaces : /a	monitored?	Σ	Yes No	
r items fit in the Sm	all Article Monitor (S	SAM)			
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	Customer Doc#.		Customer:	Saskatchewan R	lesearch Council (SRC)
	Title:	END STATE D	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPOKE-2
•)) SNC·LAVAL	IN				- Proprietary -
	al Release Form				Page 1 of 2
NU-910011+FM-001 Re	v. 4	-			cedure NU-910011-PRO-009
Section A: Validi		Fi	le No.:	NU-910011-0	035-000
	est: Recycle/landfill				
i. Last Known Loca	ition of Equipment or Mai	erial (brief history)	: SRC SlowPoke Facil	ιty	
				۸	
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ection B: Radio		neni or material at	any time been:		
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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

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	Nuclear Project#:	000302			ntract#:	255095	Deres	Page:	
	Customer Doc#:				tomer:	Saskatchew			
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nconditional R	elease Form					Ri	ef Procedure NU		ge Z of 2 IRO-039
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as any additional inerii onting?	aring required such	as (ritium s	amples, ga	amma specto	roscop)	m liquid scintil	llation [	] Yes	No No
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	Title:	END STATE	DECOMMISSIONI	NG REPORT FO	R SRC SLOWPOKE	-2
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Unconditio	nal Release For	m			Query 4 and	
NU-910011-FM-001				Ref. F	Page 1 of Procedure NU 910011-PRO-00	
			File No.:	NU-91001	1-035-000	
Section A: Vali	dity Information			and the second second	Standard States	
Last Known Lo	uest: Kemove blocks fro wather of Equipment or I ments, and handles wer	Material (brief histo	svi: Zone 1 - awaiting re	moval from SRC but	Iding. The concrete	1
Last Known Lo locks, side attach	ication of Equipment of 1 ments, and handles wer	Material (brief histo	svi: Zone 1 - awaiting re	moval from SRC but	ldurg. These concrete	
Last Known Lo locks, side attach Transfer Reque	sted by: Name	Moterial (brief his:o • previously in room	svi: Zone 1 - awaiting re	moval from SRC but	lding. The concrete	
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			Doc	147	01600-ESDF	8-002	Rev:
	Nuclear Project#.	655352	Contract			Page:	183 of 2
	Customer Doc#:		Custome	Sas	katchewan F	Research Cou	ncil (SRC)
	Title:	END STATE D	ECOMMISSION	ING RE	PORT FOR	SRC SLOWPO	OKE-2
Jnconditional R U-9100111-FM-001 Rev. 4	Release Form				Ref. Pro	Pa boodung NU-£10311-1	ngn 2 of 2 PRO-309
ection C: Radiologic	al Details						
as any additional mont ounting?	toring required such	as nitium samp <sup>i</sup> es,	gamina spectrosco	py or liq	uid scintillation	Yes	No No
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ere all of the exterior a No, provide details: n/a		monitored?		Yes Yes	🗋 Na		
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or item(s) placed to SAV	1, did it "Clear" the S/	AM? 🗌 Yes			de details: n/a	fitens are for lar	'ge for
or items do not fit in th	re Small Article Mor	nitor (SAM)	1 an	ter 1			
il large area Massiliun(s	) cleared the SAM?	🖸 Yes	🔁 Na 🛛 tř 1	lo, provi	de details: n/a	(no SAM on site)	
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			Doc#:	147-01600-ESD	R-002 Rev.
	Nuclear Project#;	655352	Contract#:	255095	Page: 184 of 2
	Customer Doc#:		Customer:	Saskatchewan	Research Council (SRC)
	Title	END STATE FACILITY	DECOMMISSIONIN	IG REPORT FOR	R SRC SLOWPOKE-2
•)) SNC·LAVAL	IN				- Proprietary -
Inconditiona	Release Form				Page 1 of 2
U-010011-FM 001 Rev				Ref. Fr	rocedure NU-910011-PRO-009
		F	ile No.:	NU-910011	-035-000
ection A: Validit	y Information				
Reason for Reque	RECYCLE	= / LANDA	=122		
Last Known Loca	tion of Equipment or Mat		FACILITY		
Transfer Requeste					
ection B: Radiol	ogical Assessment				
	nowledge, has the equipr	nent or material a	et any time been:		
Contam	unated?	П	Yes 🖬 No		
	r stored in a contaminater trough a decontamination		Yes No Yes X No		
-					
Loose Contamination	Survey Instrument	Background (cpm)	Large Area Massilinn Contamination aliove background?	If Yes, 100 cm <sup>2</sup> sample: Survey Instrument	Net Counts - Gross-Background (cpm)
	Survey		Massiinn Contamination atrove background? Yes X No	sample: Survey	- Gross-Background
Contamination	Survey	(cpm)	Massiinn Contamination ahove background?	sample: Survey	- Gross-Background (cpm)
Contamination β/γ emitters	Survey Instrument 2929 2929	(cpm)	Massiinn Contamination ahove background? Yes No Yes No Backgroun (cpm)	sample: Survey Instrument	- Gröss-Background (cpm)
Contamination β/γ emitters α emitters	Survey Instrument 2929 2929 Survey	(cpm) 88 D	Massiinn Contamination altove background? Yes No Yes No Background	sample: Survey Instrument	- Gross-Background (cpm) MET Counts = Gross-Background

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				Doc#:	147-01600-ESDR-0	02	Rev	0
Nuclear Project#:	655352		Cont	tract#.	255095	Page:	185 of	201
Customer Doc#:			Cust	omer.	Saskatchewan Res	earch Cou	ncil (SRC	)
Title:	END STA		COMMISSI	ONI	NG REPORT FOR SR	C SLOWPO	OKE-2	
Unconditional Release Form							2 ge 2 of 2	
NU-910011-FM-001 Rev 4					Ref. Proces	dure NJ-910011	PR0-009	
Section C: Radiological Details	1	-			1		-	
Was any additional monitoring required such counting?		mpies, g	anıma spectr	nscor	ey or liquid scintillation	C Yes	X No	
If Yes, give details or attach results of analyse	:5:							
Were all of the exterior and interior surfaces		-			Yes 🕅 No	,	-	
If No, provide details All accessible	e areas	: che	ected,	NIC	ST INSIDE Val	ve		
For items fit in the Small Article Monitor (	SAM)				apatan kata kata kata kata kata kata kata			
For item(s) placed in SAM, did it "Clear" the S	AM7	Yes	X No	IfN	o, provide details n/a (n	o SAM on site	)	
For items do not fit in the Small Article Mo	mitor (SAM)							
Did large area Masslinn(s) cleared the SAM?		Yes	No No	IfN	2. provide details n/a (n	o SAM oo size	)	
Was the gamma dose rate measured below b	ackground?	Yes	No	IFN	o, provide details			
Group 1 Radiation Protection Surveyor:								
Once surveys are completed by Radiation Pro from Radiation Area (mmediately after the ite					I must be removed	Date		
Section D: Health Physicist and Radia	tion Protec	tion Pr	ogram Aut	horit	y Approval			
Table 1: Maximum Surveyed Values f	or Unrestrict	ed Use	Table 2:1	Maxin	um Values for Unrestrict	ted Use		
			-		Maximum	Value	Ď.	

(Bq/Lm<sup>2</sup>)

Removable

0.3

0.01

Total

3.0

03

Radionuclide		ice Activity Bq/cm²)	Radionuclide
0.6	Total	0.063	. When with an
β/y emitters	Removable	ø	β/y emitters
	Total	0.002	a emitters
a emitters	Removable	ø	aemitters

Candu Health PhysicIst or	No Removal of item is rejected, notify owner from Section A
SRC Radiation Salety Officer	
Radiation Protection Program Authority	
Section E: Facility Manager Approval	1.40
Facility Manager.	

Candu Energy Inc. and GNG-Lavalin Ruslear Inc.

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

			Doc#:	147-01600-ESDR	-002 Rev:	
	Nuclear Project#:	655352	Contract#	255095	Page: 186 c	of 20
	Customer Doc#:		Customer:	Saskatchewan R	esearch Council (SR	C)
	Title:	END STATE I FACILITY	DECOMMISSIONING	G REPORT FOR S	SRC SLOWPOKE-2	
•)) SNC·LAVAI	IN				- Proprietary -	
	al Release Form			Ref. Fro	Page 1 of 2 coduce NU-910011-PRO-009	
		F	File No :	NU-910011-	35-000	1
ection A: Validi	ty Information					(
Description of E	quipment or Material:		identification Numbe	r (crate or tool): N//		
		1 -	1.			
fool la	ater purific	ation sy	isten.			
	Facility	insperie c	d to RM			
Last Rnown Loca	vion of Equipment of Ma	tanil (brief sister				
Last Known Loca	vion of Equipment of Ma	tanil (brief sister				
Last Known Loca	ation of Equipment or Ma SRC SC	tanil (brief sister				
. Transfer Request	ation of Equipment or Ma SRC SC	tanil (brief sister				
. Transfer Request	ation of Equipment or Ma SRC SC ted by: Name:	terial (brief history	Facility			
. Transfer Request ection B: Radio the best of your )	ation of Equipment or Ma SRC SR ted by: Name: logical Assessment	terial (brief history	Facility			
. Transfer Request ection B: Radio o the best of your ) Contan Used o	ation of Equipment or Ma SRC SC ted by: Name: Iogical Assessment mowledge, has the equip ninated? a stored in a contaminate	iterial (brief history	Tany time been Yes No Yes No			
. Transfer Request ection <b>B: Radio</b> to the best of your ) Contan Used o	ation of Equipment or Ma SRC SC ted by: Name: Ingical Assessment mowledge, has the equip ninated?	iterial (brief history	Tany time been Yes No Yes No			
. Transfer Request ection <b>B: Radio</b> to the best of your ) Contan Used o	ation of Equipment or Ma SRC SC ted by: Name: Iogical Assessment mowledge, has the equip ninated? a stored in a contaminate	iterial (brief history	Y): Fact (FYY) (any time been: Yes ⊠ No Yes □ No Yes □ No Large Area Masslino Contamination above		Net Counts = Gross Background (cpm)	
Transfer Request ection 3: Radio o the best of your ) Contain Used o Been ti Loose	ation of Equipment or Ma SRC SR ted by: Name: Instant Assessment mowledge, has the equip- ninated? a stored in a contaminate brough a decontaminatio Survey Instrument	n process?	Y): Faci (FY) tany time been: Yes ⊠ No Yes □ No Yes □ No Large Area Masslinn Contamination	I <sup>I</sup> Yes, 100 cm <sup>2</sup> sample: Survey	Net Counts = Gross Background	
Transfer Request Ection B: Radio o the best of your ) Contain Used o Been to Loose Inntamination	ation of Equipment or Ma SRC SA ted by: Name: Instead Assessment mowledge, has the equip- ninated? r stored in a contaminate brough a decontaminatio Survey	n process?	Y): Fact (FYY) (any time been: Yes ⊠ No Yes □ No Yes □ No Large Area Masslino Contamination above inackground?	If Yes, 100 cm <sup>2</sup> sample: Survey instrument	Net Counts = Gross Background (cpn)	
. Transfer Request ection B: Radio to the best of your } Contan Used to Been ti Loose Contanination β/γ emitters	ation of Equipment or Ma SRC SR ted by: Name: Instead? a stored in a contaminate brough a decontaminatio Survey Instrument 4/39.3 4/39.3	n process?	Y): Fact (FY) (any time been: Yes ⊠ No Yes □ No Yes □ No Large Area Masslinn Contamination above trackground? □ Yes □ No	HYes, 100 cm <sup>2</sup> sample: Survey instrument	Net Counts = Gross Background (cpin)	
. Transfer Request ection 3: Radio to the best of your i Contain Used to Been the Loose Containing tion B/y emitters or emitters	ation of Equipment or Ma SRC SA ted by: Name: Instead Assessment mowledge, has the equip- ninated? is stored in a contaminatio Survey Instrument 4/39/3 4/39/3 Survey	terial (brief history buPoKe ment or material a ed area? n process? Background (cpm) 143 3	Y): Fact (FY) (any time been: Yes No Yes No Yes No Yes No Large Area Masslinn Contamination above trackground? ☐ Yes No Backgroun	HYes, 100 cm <sup>2</sup> sample: Survey instrument	Net Counts = Gross Background (cpm) Ø NET Counts Gross-Background	

Camity Energy inc. and SHC-Lavalli Nacioar Inc.

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Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

Customer Dock:       Customer:       Saskatchewan Research Council (SRC)         Tile       END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2         FACILITY       FACILITY         Proceeding of the state of				Doc#	147-016	00-ESDR-0	002	Rev:
The       END STATE DECOMMISSIONING REPORT FOR SRC SLOWPOKE-2         Facility       Page 201         Brownie Status       Page 201         Brownie Facility       Page 201		Nuclear Project#:	655352	Contract#	255095		Page	187 of 2
The       FACILITY         Page 2 of 2         Page 2 of 2         Reference NULFORDER         Page 2 of 2         Reference NULFORDER         Samp additional monitoring required such as tritium samples, gamma spectroscopy or liquid scintillation         OF Reference NULFORDER         Samp additional monitoring required such as tritium samples, gamma spectroscopy or liquid scintillation         OF Reference NULFORDER         Samp additional monitoring required such as tritium samples, gamma spectroscopy or liquid scintillation         OF Reference NULFORDER         OF Reference NULFORDER <td< th=""><th></th><th>Customer Doc#:</th><th></th><th>Customer</th><th>Saskat</th><th>chewan Re</th><th>search Cou</th><th>uncil (SRC)</th></td<>		Customer Doc#:		Customer	Saskat	chewan Re	search Cou	uncil (SRC)
BIOID FRANCE FRANCE       If Mon Product Name         Samp additional monitoring required such as tritium samples, gamma spectroscopy or liquid schuttllation inting?       If We Mon         es, give details or attach results of analyses       If We Mon       No         read of the exterior and interior surfaces monitored?       If We Mon       Yes Mon         o, provide details:       AFFERIOR, LF PUTES, PUTERS, PUTERS (FILTERATION)       TADAES AST ACCESSIBLE         Terms fit in the Small Article Monitor (SAM)       YES Mon       If Mo. provide details: n/a (ao SAM on site)         Terms fit in the Small Article Monitor (SAM)       YES Mon       If Mo. provide details: n/a (ao SAM on site)         Terms fit in the Small Article Monitor (SAM)       If Mo. provide details: n/a (ao SAM on site)       If Mo. provide details: n/a (ao SAM on site)         Tage area Massinn(s) cleared the SAM7       YES       No       If Mo. provide details: n/a (ao SAM on site)         It age area Massinn(s) cleared the SAM7       YES       No       If Mo. provide details: n/a (ao SAM on site)         It age area Massinn(s) cleared the SAM7       YES       No       If Mo. provide details: n/a (ao SAM on site)         It age area Massinn(s) cleared the SAM7       YES       No       If Mo. provide details: n/a (ao SAM on site)         It age area Massinn(s) cleared the SAM7       YES       No       If Mo. provide details: n/a (ao SAM on sit		Title.	= =	ECOMMISSION	ING REPC	RT FOR S	RC SLOWP	OKE-2
BIOID FALOD Rev. 4								
samp additional monitoring required such as tritium samples, gamma spectroscopy or liquid scintillation       □ Yes       No         es, give details or attach results of analyses       I Yes       No         re all of the exterior and interior surfaces monitored?       □ Yes       No         jo, provide details:       ATEATOR: CE PUEES, PUEES FEILTRATION TRACESSALE         ritems fit in the Small Article Monitor (SAM)       If No, provide details: n/a (no SAM on site)         ritems do not fit in the Small Article Monitor (SAM)       If No, provide details: n/a (no SAM on site)         ritems do not fit in the Small Article Monitor (SAM)       If No, provide details: n/a (no SAM on site)         ritems do not fit in the Small Article Monitor (SAM)       If No, provide details: n/a (no SAM on site)         ritems do not fit in the Small Article Monitor (SAM)       If No, provide details: n/a (no SAM on site)         ritege area Massinn(s) cleared the SAM?       Yes       No         rup 1 Radiation       Protection Surveyor, Equipment or Material must be removed       Date:         rup 1 Radiation       Protection Protection Program Authority Approval       Date:         total timediately after the item(s) have been approved for removal.       Date:         rup 1 Radiation       Surface Activity (Itg/on?)       Total       Removable         B/y entitlers       Surface Activity (Itg/on?)       Total       <	nconditional R 910011-F74-001 Rev. 4	Release Form				Raf Prota		
anting?       □ Tes □ μ No         es, give details or attach results of analyses         re all of the exterior and interior surfaces monitored?       □ Yes □ No         to, provide details: <u>ATERBOR, UF PUICS</u> , <u>PUICE</u> 'S ENLIGATION TANKS <u>NET ACCESSIBLE</u> reltems fit in the Small Article Monitor (SAM)       •••         items (s) placed in SAM, did it "Clear" the SAM?       YES □ No         items (s) placed in SAM, did it "Clear" the SAM?       YES □ No         items do not fit in the Small Article Monitor (SAM)       •••         items do not fit in the Small Article Monitor (SAM)       •••         itage area Massilinn(s) cleared the SAM?       ○ No       If No, provide details: n/a (no SAM on site)         itage area Massilinn(s) cleared the SAM?       ○ No       If No, provide details: n/a (no SAM on site)         s the gamma dose rate measured below background?       ○ Yes □ No       If No, provide details: n/a (no SAM on site)         s the gamma dose rate measured below background?       ○ Yes □ No       If No, provide details:       n/a (no SAM on site)         term rediation       ••••••••••••••••••••••••••••••••••••	ction C: Radiologie	cal Details	1.1		7 p			
re all of the exterior and Interior autfaces monitored?       Yes       No         io, provide details: <u>ATERNOL OF</u> PUPES, PUPES, PUPES, FUETRATION TENNES NET ACCESSIBLE         ritems fit in the Small Article Monitor (SAM)       If No, provide details: n/a (ao SAM on site)         ritems (o) placed in SAM, did it "Clear" the SAM?       Yes       No       If No, provide details: n/a (ao SAM on site)         ritems do not fit in the Small Article Monitor (SAM)       If No, provide details: n/a (ao SAM on site)       If No, provide details: n/a (ao SAM on site)         ritems do not fit in the Small Article Monitor (SAM)       If No, provide details: n/a (ao SAM on site)       If No, provide details: n/a (ao SAM on site)         ritems do not fit in the Small Article Monitor (SAM)       If No, provide details: n/a (ao SAM on site)       If No, provide details: n/a (ao SAM on site)         ritems do ser are measured below background?       Yes       No       If No, provide details: n/a (ao SAM on site)         rul 1 Rudiation       rul 2 Yes       No       If No, provide details:       In No, provide details:         rul 1 Rudiation tection Surveyor:       If No, provide details:       Date:       Date:         rul 1 Rudiation Protection Surveyor, Equiptient or Material must be removed       Date:       Date:         rul 1 Rudiation Protection Program Authority Approval       Table 1: Maximum Values for Unrestricred Use         Radionuclide	inting?			, gamma spectrosco	py or liquid	scintillation	Ves.	No No
No. provide details:       ATERIOR, LF PLPES, PLPES, PLPES, FL.TRATION TENRS NET ACCESSIBLE         Fitems fit in the Small Article Monitor (SAM)       If No. provide details: n/a (no SAM on site)         Items do not fit in the Small Article Monitor (SAM)       If No. provide details: n/a (no SAM on site)         Items do not fit in the Small Article Monitor (SAM)       If No. provide details: n/a (no SAM on site)         Items do not fit in the Small Article Monitor (SAM)       If No. provide details: n/a (no SAM on site)         Itage area Masslinn(s) cleared the SAM?       Yes       No       If No. provide details: n/a (no SAM on site)         Is the gamma dose rate measured below background?       Yes       No       If No. provide details:         Inp 1 Radiation       If No. provide details:       Date:         Inp 1 Radiation       If No. provide details:       Date:         Inp 1 Radiation Area immediately after the item(s) have been approved for removal.       Date:         Items 1: Maximum Surveyed Values for Unrestricted Use       Table 2: Maximum Values for Unrestricted Use         Radionuclide       Surface Activity (Hq/on?)       Total       Maximum Value         B/y emitters       Removable       G       Q       Q         a emitters       Removable       G       Q       Q	es, give details or atta	ich results of analyse	5					
Items fit in the Small Article Monitor (SAM)         Item(s) placed in SAM, did it "Clear" the SAM?       Yas       No       If No. provide details: n/a (no SAM on site)         r items do oot fit in the Small Article Monitor (SAM)         I large area Masslinn(s) cleared the SAM?       Yes       No       If No. provide details: n/a (no SAM on site)         I large area Masslinn(s) cleared the SAM?       Yes       No       If No. provide details: n/a (no SAM on site)         I large area Masslinn(s) cleared the SAM?       Yes       No       If No. provide details:         s the gamma dose rate measured below background?       Yes       No       If No. provide details:         output 1 Radiation       Sate cloared the SAM?       No       If No. provide details:         output 1 Radiation       Sate cloared the SAM?       No       If No. provide details:         output 1 Radiation       Protection Surveyor:       Equipment or Material must be removed       Date:         output 1 Radiation Area immediately after the item(s) have been approved for removal.       Date:       Date:         ction D: Health Physicist and Radiation Protection Protection Program Authority Approval       Table 1: Maximum Value: [Bq/cm?]       If No. [Bq/cm?]         B/y entitlers       Surface Activity (Itag/cm²]       Radionuclide       Maximum Value: [Bq/cm?]       O.3         B/y entitlers						No	averes	2.00
Placed in SAM, did it "Clear* the SAM?       YES       No       If No. provide details: n/a (no SAM on site)         r items do oot fit in the Small Article Monitor (SAM)         I large area Masslinn(s) cleared the SAM?       Yes       No       If No. provide details: n/a (no SAM on site)         I large area Masslinn(s) cleared the SAM?       Yes       No       If No. provide details: n/a (no SAM on site)         Is she gamma dose rate measured below background?       Yes       No       If No. provide details:         nup 1 Radiation       reaction Surveyor:       No       If No. provide details:         nup 1 Radiation       Readiation Area immediately after the item(s) have been approved for removal.       Date:         ction D:       Health Physicist and Radiation Protection Program Authority Approval       Date:         ction D:       Health Physicist and Radiation Protection Program Authority Approval       Date:         ction D:       Health Physicist and Radiation Protection Program Authority Approval       Table 2: Maximum Values for Unrestricted Use         Radionuclide       Surface Activity (Hq/cm²)       Table 2: Maximum Values for Unrestricted Use       Removable         B/y emitters       3.0       0.3       0.3       0.3	io, provide cetails:	TERIOR OF PI	PES, PUNP	SEFT-TRA	THUN TH	NKS AS	ACCE SS	ILE I
I large area Masslinn(s) cleared the SAM7       Yes       No       If No. provide details: n/a (no SAM nn site)         Is the gamma dose rate measured below background?       Yes       No       If No. provide details:         outp 1 Radiation       No       If No. provide details:       No         outp 1 Radiation       No       If No. provide details:       No         outp 1 Radiation       No       If No. provide details:       No         outp 1 Radiation       Surveyor:       No       If No. provide details:         outp 1 Radiation       Surveyor:       Date:       No         ction D: Health Physicist and Radiation Protection Surveyor. Equipment or Material must be removed       Date:         ction D: Health Physicist and Radiation Protection Program Authority Approval       Date:         Table 1. Maximum Surveyed Values for Unrestricted Use       Table 2: Maximum Values for Unrestricted Use         Radionuclide       Surface Activity (Ha/cm²)       Table 2: Maximum Values for Unrestricted Use         B/y emitters       Total       Ø       No         Generatives       3.0       0.3         α emitters       Total       Ø         α emitters       Removable       0.03	r Items fit in the Sma	ill Article Monitor (	SAM)					
Large area Masslinn(s) cleared the SAM7       Yes       No       If No, provide details: n/a (no SAM nn site)         as the gamma dose rate measured below background?       Yes       No       If No, provide details:         oup 1 Radiation tection Surveyor:       If No, provide details:       If No, provide details:         oup 1 Radiation tection Surveyor:       If No, provide details:       If No, provide details:         out 1 Radiation tection Surveyor:       Date:       Date:         ce surveys are completed by Radiation Protection Surveyor, Equipment or Material must be removed madiation Area immediately after the item(s) have been approved for removal.       Date:         ction D: Health Physicist and Radiation Protection Program Authority Approval       Date:         Table 1. Maximum Surveyed Values for Unrestricted Use       Table 2: Maximum Values for Unrestricted Use         Radionuclide       Surface Activity (Hq/cm²]       Total       Maximum Value (Bq/cm²)         B/y emitters       Trital       0.3       0.3         a emitters       Trital       0.3       0.3	r kem(s) placed in SAM	M, did it "Clear" the S.	AM? Yes	No If	No. provide	details: n/a {:	to SAM on site	:)
as the gamma dose rate measured below background?       Yes       No       If No, provide details:         oup 1 Radiation tection Surveyor:       If No, provide details:         out 1 Radiation tection Surveyor:       Date:         or surveys are completed by Radiation Protection Surveyor, Equipment or Material must be removed in Radiation Area immediately after the item(s) have been approved for removal.       Date:         ction D: Health Physicist and Radiation Protection Program Authority Approval       Table 1. Maximum Surveyed Values for Unrestricted Use         Table 1. Maximum Surveyed Values for Unrestricted Use       Table 2: Maximum Values for Unrestricted Use         Radionuclide       Surfare Activity (Hq/cm²)       Table 2: Maximum Values for Unrestricted Use         B/y emitters       Total       Ø         a emitters       0.3       0.03	r items do oot fit in t	he Smatl Article Mo	nttor (SAM)					
Supplementation     Date       Date:     Date:       Date:     Date:       Construction     Date:       Date:     Date:       Construction     Protection       Protection     Protection       Pr	l large area Masslinn(	s) cleared the SAM7	T Yes	s 🕅 No Ifi	No. provide	letails: n/a (i	io SAM nn site	.)
Detection Surveyor:       Date:       Ction D: Health Physicist and Radiation Protection Program Authority Approval       Table 1. Maximum Surveyed Values for Unrestricted Use       Table 2: Maximum Values for Unrestricted Use       Radionuclide     Surface Activity (Hq/cm <sup>2</sup> )     Table 2: Maximum Values for Unrestricted Use       Radionuclide     Surface Activity (Hq/cm <sup>2</sup> )     Total     Removable       B/y emitters     Total     Ø     No.3       a emitters     Total     Ø     0.03	is the gamma dose rat	e measured below ba	ickground? Dd Yes	No III	No, provide	details		
Detection Surveyor:       Date:       Ction D: Health Physicist and Radiation Protection Program Authority Approval       Table 1. Maximum Surveyed Values for Unrestricted Use       Table 2: Maximum Values for Unrestricted Use       Radionuclide     Surface Activity (Hq/cm <sup>2</sup> )     Table 2: Maximum Values for Unrestricted Use       Radionuclide     Surface Activity (Hq/cm <sup>2</sup> )     Total     Removable       B/y emitters     Total     Ø     No.3       a emitters     Total     Ø     0.03		-						
Radiation Area immediately after the item(s) have been approved for removal.     Data       Ction D: Health Physicist and Radiation Protection Program Authority Approval       Table 1. Maximum Surveyed Values for Unrestricted Use     Table 2: Maximum Values for Unrestricted Use       Radionuclide     Surface Activity (itq/cm²)     Table 2: Maximum Values for Unrestricted Use       B/y emitters     Total     Ø       Removable     Ø     3.0     0.3       α emitters     Total     Ø       Removable     Ø     α emitters     0.3     0.03	nun 1 Barlistion							
stion D: Health Physicist and Radiation Protection Program Authority Approval       Table 1. Maximum Surveyed Values for Unrestricted Use       Radionuclide     Surface Activity (Hq/cm²)     Table 2: Maximum Values for Unrestricted Use       B/y cnitters     Total     Ø       Removable     Ø       Generation     Ø       Construction     Construction	otection Surveyor:							
Table 1. Maximum Surveyed Values for Unrestricted Use     Table 2: Maximum Values for Unrestricted Use       Radionuclide     Surface Activity (Bq/cm²)     Maximum Value (Bq/cm²)       B/γ emitters     Total     Ø       Removable     Ø       Total     Ø       Removable     Ø       Construction     0.3	otection Surveyor: ce surveys are comple	ned by Radiation Pro	tection Surveyor, E	guipment or Materi proved (or removal	al must be r	emoved	Date:	
Radionuclide         Surface Activity (Hq/cm <sup>2</sup> )         Radionuclide         (Bq/cm <sup>2</sup> )           B/y emitters         Total         Ø         Total         Removable $\alpha$ emitters         Total         Ø         B/y emitters         3.0         0.3 $\alpha$ emitters         Total         Ø $\alpha$ emitters         0.3         0.03	otection Surveyor: ce surveys are comple m Radiation Area imm	nediately after the ite	m(s) have been app	proved for removal.			Date	
Rationucide     (Bq/cm <sup>2</sup> )     Rationucide     Intel     Removable       B/y emitters     Total     Ø     B/y emitters     3.0     0.3       a emitters     Total     Ø     a emitters     0.3     0.3	ntection Surveyor: ce surveys are comple m Radiation Area inn ction D: Health Ph	nediately after the ite	m(s) have been app tion Protection P	proved for removal. Program Authori	ty Approv	ป		
B/y emitters         Total         Ø         β/y emitters         3.0         0.3           α emitters         Total         Ø         α emitters         0.3         0.3	ntection Surveyor: ce surveys are comple m Radiation Area inn ction D: Health Ph	nediately after the ite sysicist and Ratifa m Surveyed Values fo	tion Protection F tion Protection F or Unrestricted Use	proved for removal. Program Authori	ty Approv	a) for Unrestric	ted Use	
B/y emitters         Remavable         Ø         K/y emitters         3.0         0.3           a emitters         Total         Ø         a emitters         0.3         0.03	ntection Surveyor: ce surveys are comple m Radiation Area imm ction D: Health Ph Table 1: Maximu	nediately after the ite <b>sysicist and Ratifa</b> m Surveyed Values for Surface	tion Protection F or Unrestricted Use Activity	roved for removal. Program Authori Table 2: Maxi	t <b>y Approv</b> mum Values	for Unrestric Maximus (Bq/c	ted Use 1 Value m²)	
a emitters Removable a a childers was out	ntection Surveyor: ce surveys are comple m Radiation Area imm <b>ction D: Health Ph</b> Table 1. Maximu Radionuclide	nediately after the ite <b>systclist and Radia</b> m Surveyed Values for Surface (Hq/	m(s) have been app tion Protection P or Unrestricted Use Activity /cm <sup>2</sup> )	royed for removal. rogram Authori Table 2: Maxi Radionuc	ty Approv	for Unrestric Maximum (Bq/c Trital	ted Use n Value m²) Removahir	
	ntection Surveyor: ce surveys are comple m Radiation Area imm <b>ction D: Health Ph</b> Table 1. Maximu Radionuclide	nediately after the ite systelist and Radia m Surveyed Values for Surface (Hq/ Total	tion Protection F for Unrestricted Use Activity (cm <sup>2</sup> )	royed for removal. rogram Authori Table 2: Maxi Radionuc	ty Approv	for Unrestric Maximum (Bq/c Trital	ted Use n Value m²) Removahir	
	ntection Surveyor: ce surveys are comple m Radiation Area imm ction D: Health Ph Table 1. Maximu Radionuclide B/y emitters	nediately after the ite systelist and Radia m Surveyed Values for Surface (Itg/ Total Removable Total	tion Protection P or Unrestricted Use Activity (cm <sup>2</sup> ) Ø	Program Authori Table 2: Maxi Radionuc B/y ceriti	ty Approv mum Values lide	al for Unrestric Maximus (Bq/c Tutal 3.0	ted Use n Value m²) Removahle 0.3	
	otection Surveyor: ce surveys are comple m Radiation Area imm ction D: Health Ph Table 1. Maximu Radionuclide β/γ emitters α emitters	nediately after the ite systelist and Radia m Surveyed Values for Surface (Hq/ Total Removable Total Removable	tion Protection P or Unrestricted Use Activity /cm <sup>2</sup> ] Ø Ø	royed for removal. rogram Authori Table 2: Maxi Radionuc β/y certiti α cmitte	ty Approv mum Values lide	al for Unrestric Maximus (Bq/c Tutal 3.0	ted Use n Value m²) Removahle 0.3	
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				147-01600-ESD	
	Nuclear Project#	655352	Contract#:	255095	Page 188 o
	Customer Doc#:		Customer.	Saskatchewan	Research Council (SR
	Title:	END STATE	DECOMMISSIONIN	IG REPORT FOR	R SRC SLOWPOKE-2
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	al Release Form				
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			File No.	NU-910011	
ection A: Valid	ity Information				
Reason for Regu	est: Recycle				
Last Known Loca	tion of Equipment or Ma	iterial (brief histo	ry). Plates and I beams v	vere used to retrieve	· reactor compenents
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Reason for Requ Last Known Loca of for loading of bi Transfer Request	ition of Equipment or Ma ns	aterial (brief histo	ry). Plates and I beams v		· reactor compenents
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		Doc#:	147-01600-ESD	R-002	Rev.	0
Nuclear Project#:	655352	Contract#:	255095	Page	189 of	201
Customer Doc#:		Customer:	Saskatchewan	Research Cou	ncil (SRC	)
Title:	END STATE DE FACILITY	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPO	OKE-2	

## **Unconditional Release Form**

NU-910011-FM 001 Rev. 4

Page 2 of 2 Ref. Procedure NU-910011 PRO-00P

ounting?						
f Yes, give details or atta	ch results of analyses:					
Vere all of the exterior a	nd intérior surfaces monitored	17		🛛 Yes	No No	
(No, provide details		_				
or items fit in the Sma	Il Article Monitor (SAM)					
or item(s) placed in SAM	4, did it "Clear" the SAM?	🖂 Yes	🗌 No	k <u>No, provi</u>	de details: n/a	(no SAM on site)
For Items do not fit in t	he Small Article Monitor (SA	M)				
Did large area Masslinn()	) cleared the SAM?	🗋 Yes	No No	IFNo provi	de details; n/a	(no SAM on site)
Was the gamma dose rat	e measured below background	12 🖾 Yes	📋 No	If No. provi	de details:	
Group 1 Radiation						
Protection Surveyor:						
Once surveys are comple	ted by Radiation Protection St	arveyor, Equ	upment or M	Aaterial must i	be removed	Date:
rom Radiation Area Imm	adiately after the itemfs) have	e heen annre	oved for rem	noval		DATE
ection D: Health Ph	ysicist and Radiation Pro	tection Pr	ogram Aut	thority Appr	ues for Unrest	
Section D: Health Ph	ysicist and Radiation Pro m Surveyed Values for Unrest Surface Activity	tection Pr	ogram Aut Table 2.	thority Appr	ues for Unrest Maxim	ricted Use um Volue ./cm²)
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		Doc#:	147-01600-ESDF	R-002	Rev:	0
Nuclear Project#:	655352	Contract#;	255095	Page:	190 of	201
Customer Doc#:		Customer.	Saskatchewan F	Research Cour	ncil (SRC)	)
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## Appendix K PROJECT SCHEDULE

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

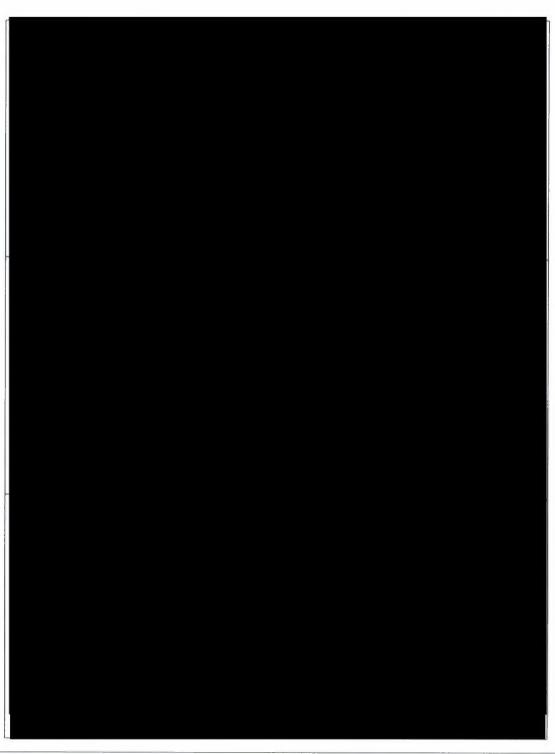
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Customer Doc#:		Customer.	Saskatchewan F	Research Cour	ncil (SF	RC)
Title:	END STATE D FACILITY	ECOMMISSIONIN	IG REPORT FOR	SRC SLOWPC	KE-2	

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Bh         Original           2211         74000           2211         74000           2211         74000           2211         74000           2211         74000           2211         74000           2211         74000           2211         74000           2211         74000           2211         74000           2211         0.00           22121         0.00
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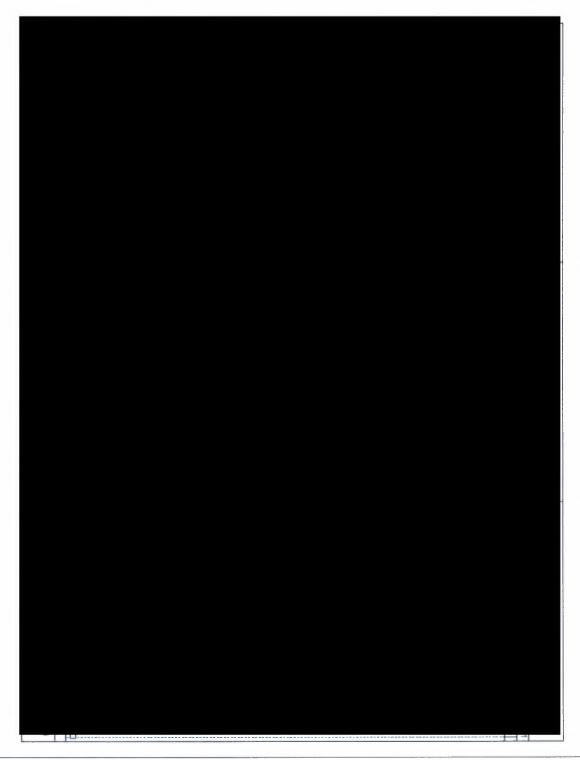
Candu Energy Inc. and SNC-Lavalin Nuclear Inc.

		Doc#:	147-01600-ESDR-00	2	Rev:	0
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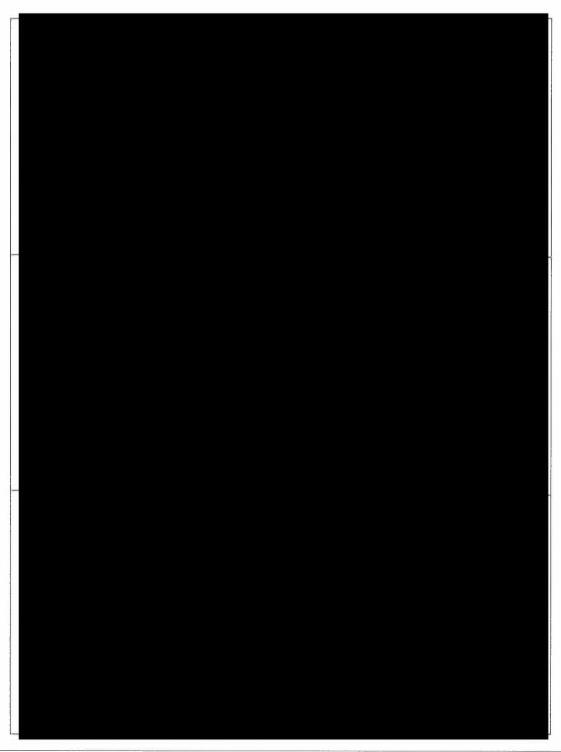


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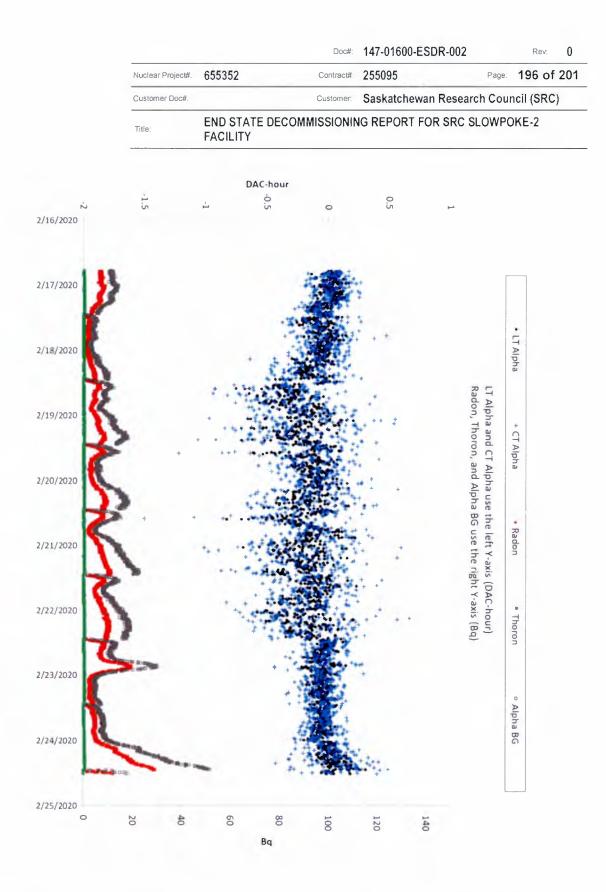


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		Doc#:	147-01600-ESDR-002		Rev:	0
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Appendix L ICAM REPORT

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.



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Customer Doc#:		Customer.	Saskatchewan Res	earch Cour	ncil (SRC)
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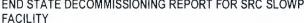
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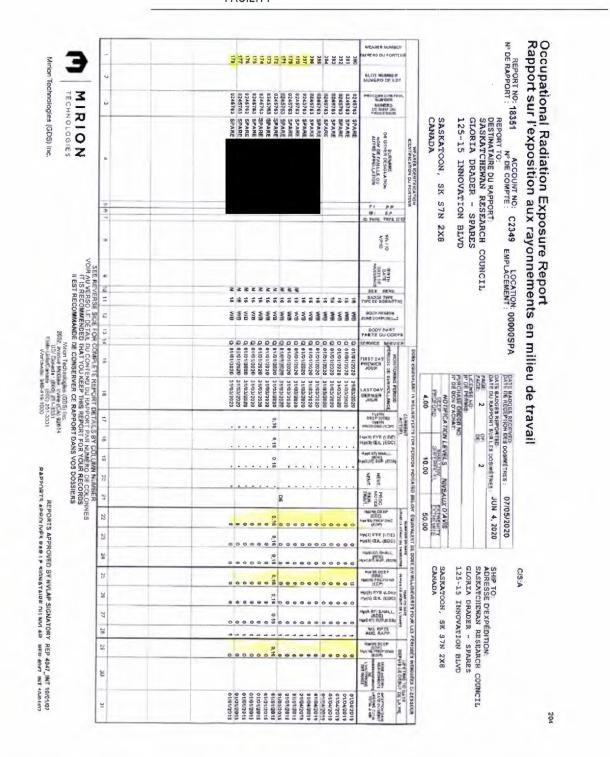
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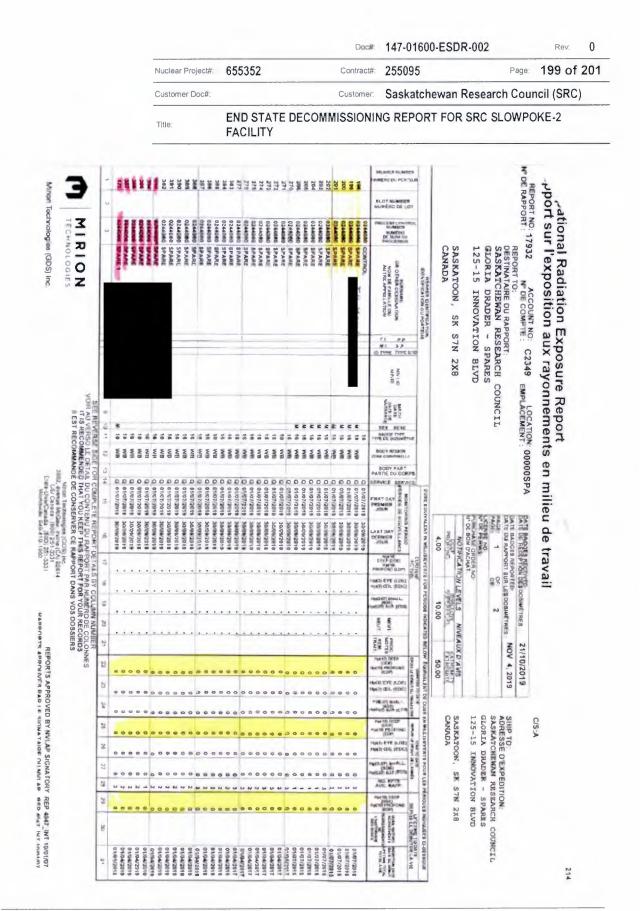
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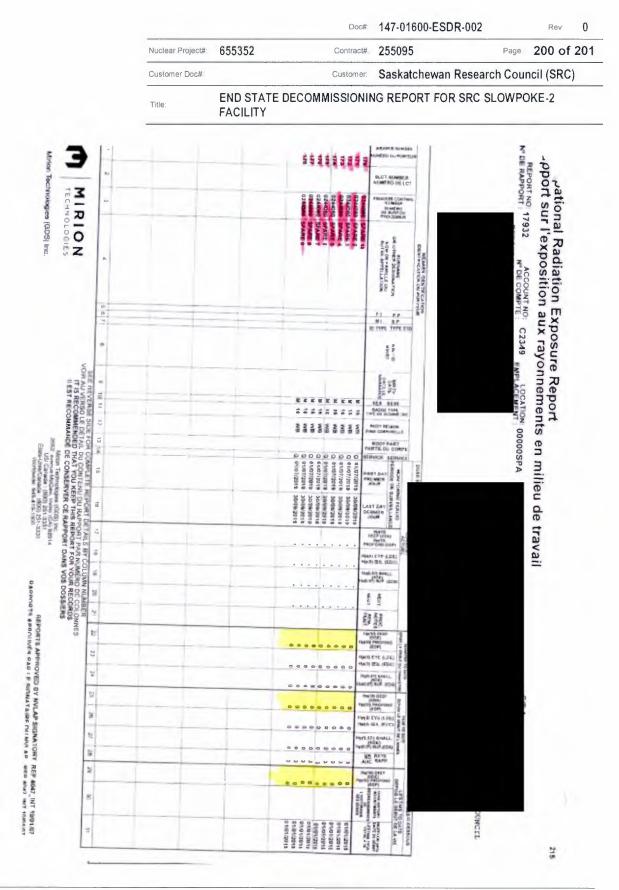
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## Appendix N PROJECT BUDGET UPDATE SRCSF

Cost Element	Budget
Labour	\$2,935,000
Materials	\$763,000
Equipment	\$178,000
Waste Management	\$850,000
Environmental Assessment	\$56,400
Monitoring	\$178,000
Administration (e.g., training, safety, project management, government and public liaison	\$1,066,000
Energy	\$5,926
Taxes	\$285,500
Regulatory agency fees	\$0
Contingency plans	\$348,000

The actual project cost is less than the budgeted cost.

Candu Energy Inc. and SNC-Lavalin Nuclear Inc.