Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Supplier Document

Environmental Impact Statement In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - Executive Summary

WLDP-26000-ENA-002

Revision 5.0

Accepted by:	Jeffrey Miller	2025/01/17
	Manager, Regulatory Approval	Date

CANADIAN NUCLEAR LABORATORIES

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Environmental Impact Statement for the In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site - Executive Summary Revision 5

Submitted to:
Canadian Nuclear Laboratories
Whiteshell Laboratories
1 Ara Mooradian Way
Pinawa MB R0E 1L0

Document Number: WLDP-26000-ENA-002

wsp

January 2025

This page intentionally left blank

Table of Contents

LIST OF FIGURES

EXECUTIVE SUMMARY

Introduction

Canadian Nuclear Laboratories is decommissioning the Whiteshell Laboratories nuclear research facility, with complete site closure planned for 2027. Canadian Nuclear Laboratories is licensed to perform this work under a Canadian Nuclear Safety Commission decommissioning licence (Licence No. NRTEDL-W5-8.00/2024). A Comprehensive Study Report under the *Canadian Environmental Assessment Act (1992)* was completed for the decommissioning project in 2001.

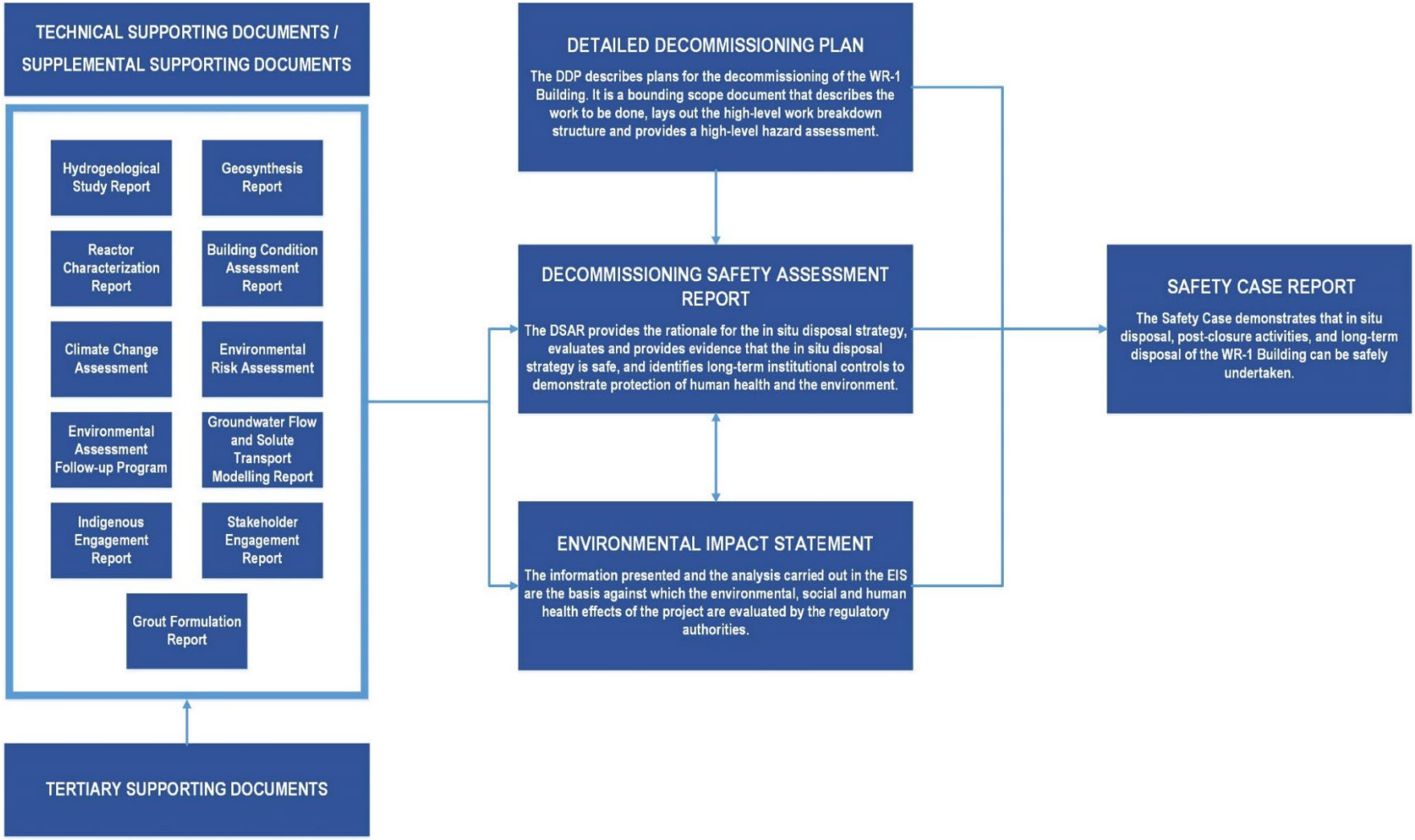
Canadian Nuclear Laboratories is applying for an amendment to the current decommissioning licence to carry out In Situ Decommissioning of Whiteshell Reactor 1 at the Whiteshell Laboratories Site (the Project), rather than dismantling and demolition as previously assessed in the Comprehensive Study Report. The in situ disposal approach includes partial dismantling and demolition along with passive, permanent disposal of the below-grade portions of Whiteshell Reactor 1. In situ disposal is a proven decommissioning approach that increases worker safety, provides protection of the environment and the public, reduces interim storage and multiple handling, enables permanent nuclear liability reduction, and utilizes fewer resources.

The modified in situ disposal approach, qualifies as a designated project under Section 37(b) of the Regulations Designating Physical Activities of the *Canadian Environmental Assessment Act, 2012,* as it relates to "the long-term management or disposal of irradiated fuel or nuclear waste." A key element of the regulatory approvals process is the completion of an environmental assessment under the *Canadian Environmental Assessment Act, 2012*, the results of which are documented in this Environmental Impact Statement. The environmental assessment is an iterative project planning process, intended to affirm that proposed activities will not cause significant adverse environmental effects. The assessment is completed to demonstrate that proposed activities can be safely completed in compliance with the prescribed protective limits, including radiological doses to workers and members of the public and the releases of contaminants to the surrounding environment. The environmental assessment considers the closure phase (which includes decommissioning and reclamation) and long-term performance during the post-closure phase (which includes institutional control and post-institutional control). Canadian Nuclear Laboratories has prepared this Environmental Impact Statement, along with supporting technical documents, as part of the proposal to the Canadian Nuclear Safety Commission to allow use of in situ disposal. Figure 1 summarizes how each document fits into the proposal.

Whiteshell Laboratories

Whiteshell Laboratories was established in the early 1960s by Atomic Energy of Canada Limited. The Whiteshell Laboratories site is in southeastern Manitoba, approximately 100 kilometres northeast of Winnipeg and 10 kilometres west of the Town of Pinawa. The Whiteshell Laboratories site was used for significant research programs, including the operation of Whiteshell Reactor 1, the Nuclear Fuel Waste Management Program, the SLOWPOKE demonstration reactor and reactor safety analysis. The building that houses Whiteshell Reactor 1 is in the Whiteshell Laboratories Main Campus (Figure 2).

Whiteshell Laboratories is a government-owned and contractor-operated facility. The site, including all assets and liabilities, is owned by Atomic Energy of Canada Limited, a federal government Crown corporation. Atomic Energy of Canada Limited contracted Canadian Nuclear Laboratories to operate the facility and perform the decommissioning work.



DDP = Detailed Decommissioning Plan; DSAR = Decommissioning Safety Assessment Report; EIS = Environmental Impact Statement.

Figure 1: Whiteshell Reactor 1 In Situ Disposal Documents Interrelationship

Figure 2: Location of the Whiteshell Laboratories Site

The Whiteshell Laboratories site has a total area of 4,375 hectares and is within the boundaries of the Local Government District of Pinawa. The Winnipeg River passes though the Whiteshell Laboratories site. Nearby communities include the town of Lac Du Bonnet, the Local Government District of Pinawa, and the town of Seven Sisters Falls. Each community is located on the shore of the Winnipeg River. The majority of the Whiteshell Laboratories site is located on Treaty 3 land. A small portion of the Whiteshell Laboratories site, on the west side of the Winnipeg River, is located on Treaty 1 land. Communities that form part of Treaties 1, 3 and 5 have historical and current land use ties with the area. Anishinaabe and Ojibway communities with historical traditional territories that have expressed interest in the Project include the Sagkeeng and Brokenhead First Nations in Treaty 1; Black River and Hollow Water First Nations in Treaty 5; and Shoal Lake No. 40, Iskatewizaagegan No. 39 Independent First Nation (Shoal Lake No. 39 First Nation), Northwest Angle No. 33 and Wabaseemoong Independent Nations in Treaty 3.

The Project is also located in the homeland of the Red River Métis. The Red River Métis Citizens live in the region around the Whiteshell Laboratories site and may use the lands nearby for traditional activities.

Current Status of Whiteshell Reactor 1

The Whiteshell Reactor 1 is a research reactor that tested the concept of an organic coolant, allowing lower operating pressure and correspondingly higher operating temperature than light water reactors. The Whiteshell Reactor 1 is a small reactor (60 megawatts thermal), located primarily in a below-grade structure (Figure 3).

The Whiteshell Reactor 1 operated from 1965 to 1985. Following safe operational shut-down, the first stage of decommissioning commenced in 1989 and lowered the radioactivity in Whiteshell Reactor 1. The reactor fuel was removed and placed in storage at the on-site Waste Management Area and liquids such as the organic coolant and moderator water were drained and collected. Some of the reactor systems and equipment were decommissioned, removed and placed in storage at the Waste Management Area. The reactor has been in a safe storage with surveillance phase since 1995.

Figure 3 shows an illustration of the Whiteshell Reactor 1 facility. The majority of the remaining radioactivity in the Whiteshell Reactor 1 facility is in the reactor core (calandria and fuel channels).

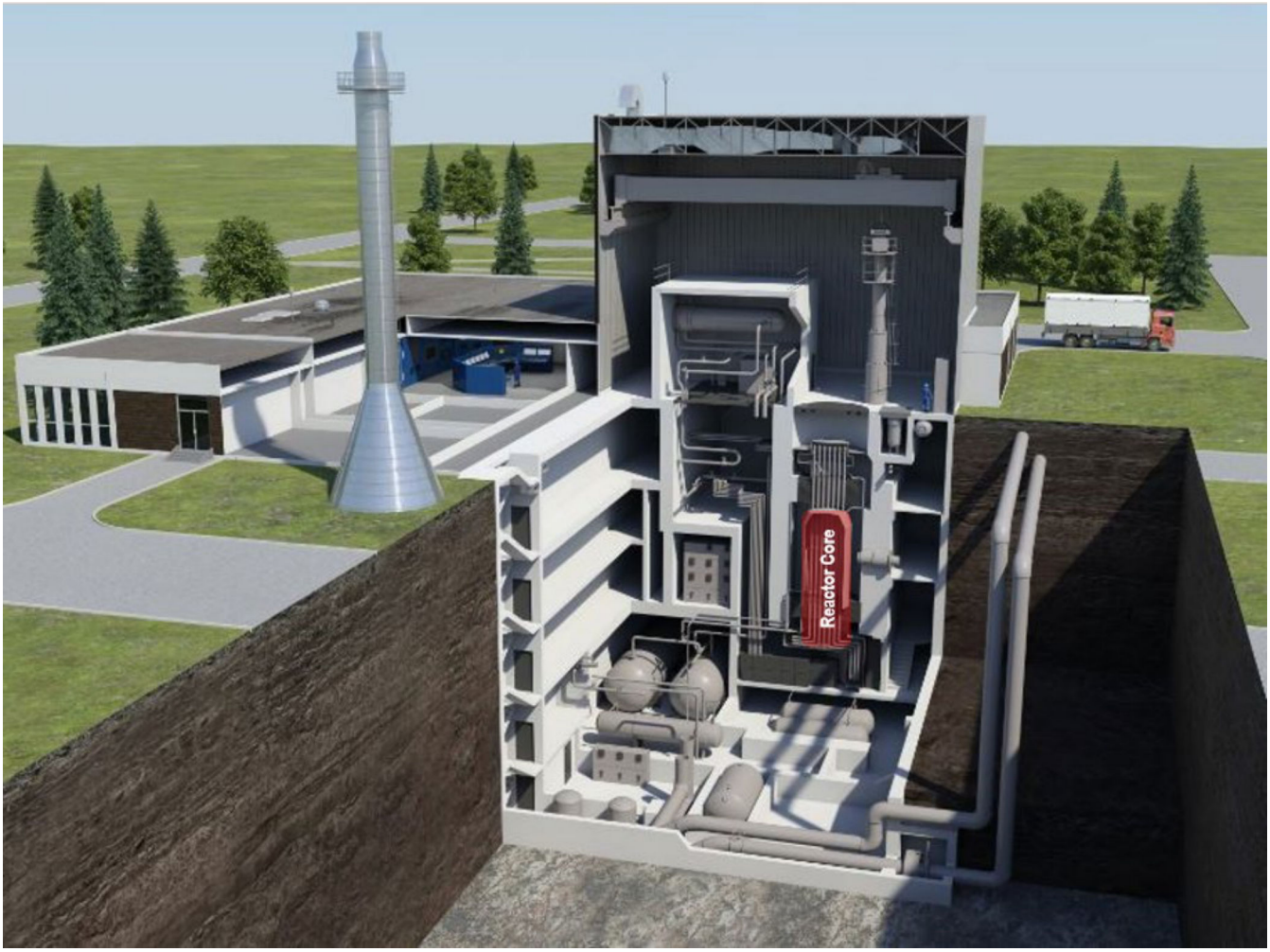


Figure 3: Whiteshell Reactor 1 Facility

Alternatives Analysis

The purpose of the Project is to safely reduce the legacy nuclear liability of Whiteshell Reactor 1 in a cost-effective manner. Canadian Nuclear Laboratories identified four alternatives as potential means to achieve the project purpose. These are:

- Alternative #1 – Deferred Dismantling and Removal;
- Alternative #2 – Immediate Dismantling and Removal;
- Alternative #3 – In Situ Disposal; and
- Alternative #4 – Partial Dismantling and Removal with In Situ Disposal of the Remainder.

In addition to the alternatives identified by Canadian Nuclear Laboratories, the following two alternatives were included in the assessment as a result of feedback and suggestions from public and Indigenous engagement:

- Alternative #5 – In Situ Disposal Using Alternative Backfill Materials; and
- Alternative #6 – Rolling Stewardship.

Per guidance from the *Canadian Environmental Assessment Act, 2012*, all six alternatives were evaluated for their technical feasibility (e.g., whether the approach has been used elsewhere and can be easily adapted to this application). For those alternatives deemed to be technically feasible, a comparison of economic feasibility (i.e., cost), safety and environmental effects was completed for each phase of the Project: closure (when work is performed) and post-closure, which is separated into two discrete periods: 1) institutional control (near future) and 2) post-institutional control (far future). Canadian Nuclear Laboratories developed the evaluation criteria and carried out the assessment to determine the preferred alternative. The technical and economic feasibility criteria were evaluated as pass or fail. The effects on the environment were broken down with equal weighting of 30% for worker, public and biophysical environmental effects, because all three are fundamentally linked and the assessment does not value the safety of one group of people over another. Socio-economic criteria were given a 10% weight, as physical health and safety are of higher priority than socio-economic health, although both are important in the decision-making process.

Alternative #5 (In Situ Disposal with Alternative Backfill) and Alternative #6 (Rolling Stewardship) were deemed not technically feasible in the post-institutional control period. Alternative #5 (using sand as an alternative backfill material) is not easily adaptable for use in Whiteshell Reactor 1 because of the issue of the material settling with time and being a poor barrier to water movement. Alternative #6 (rolling stewardship) did not meet the feasibility criteria for being passively safe, as it required an undefined long-term human intervention period to be safe. The remaining four alternatives were carried forward for assessment.

The assessment considers only alternatives that can safely achieve the Project goals and are technically feasible. The recommended alternative for the decommissioning of Whiteshell Reactor 1, based on the alternatives analysis, is Alternative #3 In Situ Disposal. The selection of in situ disposal was based on the safety, environmental, technical, and economic factors. In situ disposal is a safe option, reducing the risk to workers compared to dismantling and providing long-term safety to the public and the environment. The in situ disposal approach also has the least reliance on undefined future disposal options or technologies.

Based on the characterization and understanding of the hazards associated with Whiteshell Reactor 1, Canadian Nuclear Laboratories believes that the Whiteshell Reactor Disposal Facility can be built to meet Canadian Nuclear Safety Commission regulations, incorporating the recommendations from the International Atomic Energy Agency related to radiological waste disposal. Canadian Nuclear Laboratories also believes that the safety case has been made and provides evidence that this dedicated facility can be used to permanently dispose of the waste, rather than temporarily store it as required by other alternatives.

Canadian Nuclear Laboratories did engage the public and Indigenous Nations about the alternative means conducted and received feedback, It is clear that First Nations would apply different values and weightings to alternative means. They would bring their unique perspective and traditional views to an assessment. Canadian Nuclear Laboratories recognizes that Indigenous Nations would prefer to see other alternatives exercised. All engaged First Nations and the Red River Métis have expressed a varying level of concern over Alternative #3 In Situ disposal or have expressed a preference for Alternative #2 Immediate Dismantling and Removal, which results in all waste removed from their traditional territory. Sagkeeng First Nation provided the most extensive feedback of all First Nations and the Manitoba Métis Federation. Canadian Nuclear Laboratories has carefully considered Sagkeeng First Nation's views, opinions and interests and have ongoing engagements and commitments to Sagkeeng First Nation that reflect their input on Alternative Means Assessment; especially around trauma informed engagement and risk-informed communications to address psychosocial effects. Canadian Nuclear Laboratories has invested in and is committed to ongoing engagement with Indigenous Nations to discuss all issues and concerns.

Project Description

The Project activities assessed in this Environmental Impact Statement are limited to in situ disposal of the below-grade portion of the Whiteshell Reactor 1 Building. Other decommissioning activities for the Whiteshell Laboratories site and the balance of Building 100 where Whiteshell Reactor 1 is housed, documented in the Comprehensive Study Report, have not changed and do not need to be reassessed. The purpose of the Project is to safely decommission Whiteshell Reactor 1 and the Whiteshell Reactor 1 Building, reducing Canada's long-term nuclear legacy liabilities through permanent, passive disposal. Canadian Nuclear Laboratories is committed to completing all decommissioning work in a way that is safe for workers and the public, and ensuring safe, long-term performance that protects the environment and people, and considers and addresses Indigenous interests.

The Whiteshell Reactor Disposal Facility is designed to provide passive containment and isolation of the wastes. Containment is achieved through robust design based on multiple barriers that includes using combined inherent natural and engineered barriers to provide safety following the decommissioning of Whiteshell Reactor 1. Systematically, the natural and engineered barriers include the reactor core and bioshield, grout fill, building foundation, concrete cap and engineered cover, and finally the geologic surround. This concept is shown schematically on Figure 4.

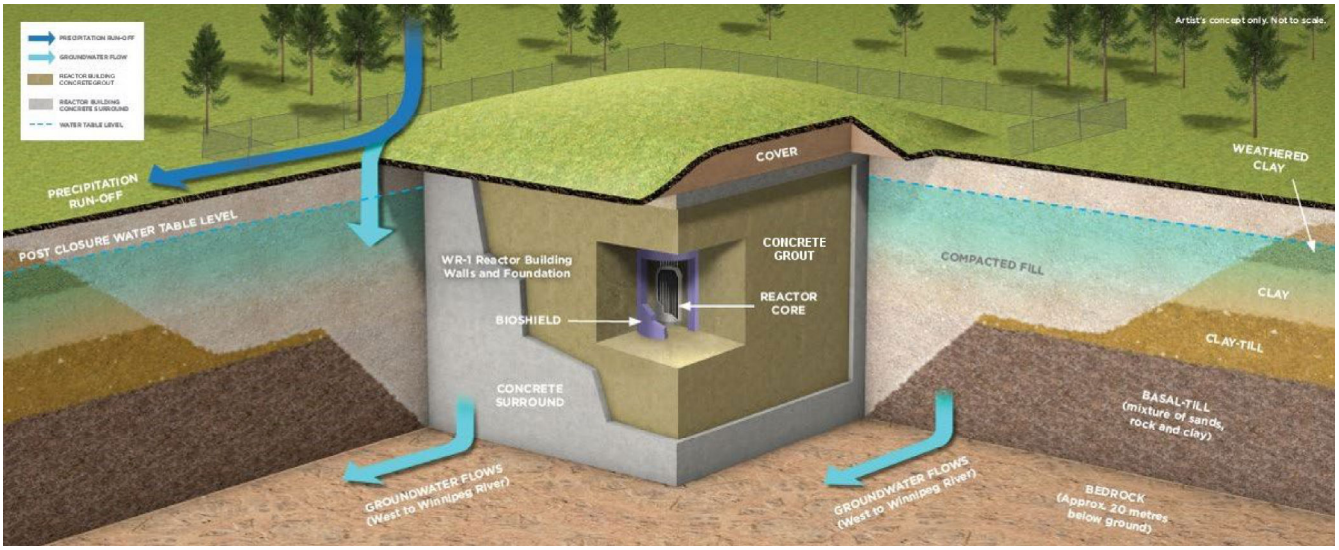


Figure 4: The In Situ Disposal Waste Disposal System

The primary pathway for release of contamination from the Whiteshell Reactor Disposal Facility is through groundwater that has infiltrated into the sub-surface structure, picked up contamination and then carried it out of the sub-surface structure to the surrounding environment. Each of the barriers contributes to containing and isolating the waste from people and the environment. Combined, the barriers form a rigorous system that provides long-term safety to the public and the environment, with environmental monitoring to be conducted to verify the effectiveness of the barriers.

The decommissioning activities for Whiteshell Reactor 1 assessed in the Environmental Impact Statement include:

- **Preparation for In Situ Disposal** – Preparation will involve a combination of sealing penetrations in the exterior walls of the Whiteshell Reactor 1 Building; penetrating internal walls and equipment to provide flow paths for grout, displaced air and dissipated heat; and establishing temporary infrastructure to support grout production and placement. Some hazardous materials will be remediated prior to in situ disposal. Remediation will be limited to materials that are unsuitable for in situ disposal or that are easily removable. This will help keep exposures to workers, the public and the environment As Low As Reasonably Achievable. All building services will be deactivated.
- **Grouting of below-grade structures and systems** – Grout will be used for filling void spaces of the Whiteshell Reactor 1 below-grade structure. Filling of structural void spaces for in situ disposal serves the purpose of stabilizing the structure to prevent subsidence and impeding the flow of groundwater through the Whiteshell Reactor Disposal Facility. The grout is designed to use local materials to help with the manufacturing process, and because of its flowable nature, can be introduced into the smaller, less accessible spaces of most structures. Grouting of the below-grade structure will be carried out in stages to optimize the filling and curing process. Each lift of grout will be given sufficient time to cure before additional grout is poured. Quality control measures on grouting operations will be implemented to provide confidence that the final product performs as expected.

- **Removal of above-grade structures and systems** – The above-grade Whiteshell Reactor 1 components and portion of the building will be dismantled and removed after grouting has been completed. Recyclable materials will be separated and recycled, where practicable. Radiological and non-radiological hazardous materials will be remediated where options exist, and managed in accordance with Canadian Nuclear Laboratories requirements for Environmental Protection and Management of Waste.
- **Installation of a concrete cap and engineered cover** – After grouting has been completed and the other portions of the Whiteshell Reactor 1 Complex demolished, a reinforced concrete cap and engineered cover will be constructed on top of the grouted area. The concrete cap will serve as a deterrent to resist inadvertent intrusion into the facility. It will also resist animal and plant intrusion. The engineered cover will be installed to divert surface water run off away from the Whiteshell Reactor Disposal Facility, limit water infiltration, protect the concrete cap for environmental elements, and support the growth of native vegetation.
- **Final site restoration** – Upon completion of the installation of the final concrete cap and engineered cover, a grass seed mixture native to the area will be used to establish vegetative cover. The surrounding grounds that were disturbed during demolition and decommissioning activities will be graded and restored with a grass seed mixture compatible with the surrounding area with input by First Nations communities and the Red River Métis. Stormwater management for the reclaimed Whiteshell Laboratories site will have similar physical characteristics to the natural drainage systems in the general geographic region in terms of dynamic stability, robustness, and longevity.
- **Preparation for institutional control** – The engineered cover will be fenced in with signage as part of the institutional controls. Routine surveillance of the site will include inspecting the engineered cover for subsidence, erosion, and animal or other disturbances. Additional groundwater monitoring wells will be installed above and beyond the existing environmental monitoring activities, as required, to monitor the performance of the Whiteshell Reactor Disposal Facility.

Project Timeline

Canadian Nuclear Laboratories plans to start decommissioning activities for the Whiteshell Reactor 1 Building in 2022. Once decommissioning and grouting work is complete, the Whiteshell Reactor Disposal Facility will be turned over to institutional control in 2031, which is assumed to last for a minimum of 100 years during which environmental monitoring and surveillance activities will be carried out. However, it is recognized that institutional control will continue until the Canadian Nuclear Safety Commission agrees it is no longer needed.

The Project phases are:

- **Closure phase** – Preparation for and implementation of in situ disposal, which includes grouting of below-grade structures and systems, removal of above-grade Whiteshell Reactor 1 building structures and systems, installation of the concrete cap and engineered cover, and environmental controls and final site restoration. These activities last from 2026 to 2031.
- **Post-closure phase** – The post-closure phase has two discrete periods: institutional control and post-institutional control. Institutional control is estimated to last a minimum of 100 years, during which long-term performance monitoring and maintenance activities will continue, to demonstrate compliance with the safety case assumptions. Although the duration of institutional control is estimated at a minimum of 100 years, it is recognized that it will continue until the Canadian Nuclear Safety Commission agrees

institutional controls are no longer needed. Post-institutional control occurs after year 2131 and continues indefinitely; however, the timeframe defined for the assessment of potential effects, as part of the normal evolution of the Project's safety assessment is 10,000 years. This timeframe (i.e., 10,000 years) encompasses the phase in which peak effects are anticipated.

Indigenous Engagement

Indigenous engagement is a key component of the environmental assessment process. As part of its corporate, environmental, and social responsibility, Canadian Nuclear Laboratories is committed to ongoing engagement and relationship building with the First Nations (i.e., Sagkeeng First Nation, Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation, Wabaseemoong Independent Nations) and the Manitoba Métis Federation throughout the course of the environmental assessment process for the Project and ongoing Whiteshell Laboratories closure.

Canadian Nuclear Laboratories has five overarching Indigenous engagement goals:

- **Build awareness and mutual understanding** by supporting and facilitating opportunities for mutual learning including current and traditional use, and values and perspectives on nuclear decommissioning, environmental remediation and radioactive waste management to demonstrate Canadian Nuclear Laboratories' long-term commitment and inclusive approach to safe and responsible management of Atomic Energy of Canada Limited's radioactive waste and decommissioning liabilities (e.g., through Project and site monitoring activities).
- **Share information on the Project, including the potential effects on the environment.** This includes working collaboratively with the First Nations and the Manitoba Métis Federation to co-develop meaningful, user-friendly information and communication products. Our outreach on the Project includes engagement with leadership, along with working-level discussions and community engagement all the while providing adequate capacity supports to help facilitate meaningful dialogue and engagement.
- **Seek input and feedback from the First Nations and the Manitoba Métis Federation** regarding Project related activities, and traditional and current uses of the land surrounding the Whiteshell Laboratories site. Initiate early and meaningful two-way communication channels between Canadian Nuclear Laboratories and the First Nations and the Red River Métis to determine the best methods for sharing information and to provide opportunities for Indigenous Nations to provide input on project considerations including the design, the environmental assessment process, and the assessment of effects.
- **Develop long lasting relationships with the First Nations and the Manitoba Métis Federation** to support continued involvement in the Project, community healing and reconciliation. This will extend beyond the scope of the environmental assessment process for the Project.
- **Meet or where possible exceed all regulatory-based communication and engagement requirements** and facilitate engagement that reflects current memorandums of understanding and contribution agreements, and that considers the interests, needs perspectives and priorities of each Indigenous Nation.

Engagement with Indigenous Nations for the Project began in 2016 and is ongoing. Canadian Nuclear Laboratories has reached out to and/or engaged with Sagkeeng First Nation, the Manitoba Métis Federation, Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation, Wabaseemoong Independent Nations, Shoal Lake No.40 (Treaty No.3), Iskatewizaagegan No.39 Independent First Nation (Shoal Lake No.39 First Nation)

(Treaty No.3), Northwest Angle No. 33 (Treaty No.3), and Grand Council Treaty #3. Although effort was made to reach out to all the First Nations, the Manitoba Métis Federation, and Indigenous organizations identified, particular effort was placed on outreach to the Nations and organizations who expressed interest in the Project or that live and practice traditional activities in closest proximity to the Whiteshell Laboratories site. These Nations are Sagkeeng First Nation, Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation, Wabaseemoong Independent Nations, and the Red River Métis, represented by the Manitoba Métis Federation. Regardless of the level of interest shown by each Nations, Canadian Nuclear Laboratories continues to send Project updates, to keep all identified Nations related to the Project informed and the channel for engagement open.

Canadian Nuclear Laboratories recognizes the importance of seeking direction from the First Nations and the Red River Métis on how they want to engage on this Project. Canadian Nuclear Laboratories also recognizes and respects that each Indigenous Nation is unique and may have different approaches, needs, and interests for engagement on this Project. Various engagement methods were designed to share information, and support collaboration with Indigenous nations, while fulfilling Canadian Nuclear Laboratories' corporate and regulatory objectives. The methods Canadian Nuclear Laboratories has utilized to date are diverse and vary based on expressed community need and desired methods. Examples of engagements include general information sharing sessions, webinars, technical workshops, presentations, site tours and activities focused on community meetings, workshops and long-term relationship building.

Feedback Canadian Nuclear Laboratories has received during engagement with Indigenous Nations has been considered during the environmental assessment process. Key themes of the issues and concerns provided through feedback received to date on the Project and Canadian Nuclear Laboratories' response to the feedback are summarized below. Canadian Nuclear Laboratories remains committed to addressing outstanding issues and concerns through ongoing discussions and initiatives developed in collaboration with respective nations. CNL has documented this and all other commitments it has made to the First Nations and the Manitoba Métis Federation in a consolidated Commitments List, to be submitted to the CNSC as part of the licence application.

Relationship Building

To help facilitate greater engagement with Sagkeeng First Nation, Canadian Nuclear Laboratories, Sagkeeng First Nation, and Atomic Energy of Canada Limited have established a Technical Working Group to resolve outstanding concerns and work collaboratively on areas of interest by developing and implementing initiatives that will help address Sagkeeng First Nation's concerns on the Project. The Technical Working Group meets monthly to support ongoing, constructive dialogue to develop and implement initiatives that were identified by Sagkeeng to help address some of their concerns related to the Project. These initiatives include a community-based monitoring program, leadership table, and community liaison committee. The Technical Working Group has also formalized a contribution agreement to provide funding for the first year of activities that will form the basis of a long-term relationship agreement. Canadian Nuclear Laboratories provides capacity to employ a Community Liaison that works closely to exchange information between Canadian Nuclear Laboratories and community members.

The Manitoba Métis Federation and Canadian Nuclear Laboratories have invested in the development of a positive and collaborative relationship since 2017. Canadian Nuclear Laboratories and the Manitoba Métis Federation have been working together to develop a multi-year relationship agreement that will help to mitigate the Red River Métis' concerns on the Project and ensure the Red River Métis are represented and have the opportunity to participate in environmental monitoring, communication initiatives, and other key initiatives.

Canadian Nuclear Laboratories, Black River First Nation, and Hollow Water First Nation signed a Relationship Agreement to support greater community involvement in the Project. The relationship agreement supports the establishment of a community liaison committee, a community liaison position, support to participate in the Indigenous Advisory Committee if desired and provide capacity support to ensure the Nations can continue to participate in discussions on future land use of the Whiteshell Laboratories site.

The In Situ Disposal Approach

Sagkeeng First Nation and the Manitoba Métis Federation have raised concerns about the in situ disposal approach and have stated their preference for complete removal of the Whiteshell Reactor 1 facility from the site. The First Nations and the Manitoba Métis Federation expressed an interest in understanding how the grouted encapsulation would maintain its integrity into the future. The Manitoba Métis Federation and Sagkeeng First Nation have stated that the risks from in situ disposal will still be present and would have the potential to adversely impact them and their ability to exercise their rights. Brokenhead Ojibway Nation, Hollow Water First Nation and Black River First Nation expressed interest in understanding how in situ disposal was chosen as the preferred decommissioning method for the Whiteshell Reactor 1.

Canadian Nuclear Laboratories provided information on how the different engineered barriers of the in situ disposal design ensure the waste is properly contained and isolated from the environment. Canadian Nuclear Laboratories also explained that immediate dismantling of Whiteshell Reactor 1 does not guarantee its immediate removal from site, primarily because alternatives do not exist for disposal of the waste. Recognizing that environmental protection and the integrity of the in situ disposal design will continue to be an area of interest for the communities, Canadian Nuclear Laboratories has put in place engagement mechanisms to discuss and make efforts to address residual areas of concern.

Alternative Means Assessment

Sagkeeng First Nation continues to have strong reservations with in situ disposal and the way in which Canadian Nuclear Laboratories conducted its Alternative Means Assessment. Sagkeeng First Nation's most preferred decommissioning method for the Whiteshell Reactor 1 is immediate full removal and Sagkeeng First Nation's least preferred decommissioning method is in situ disposal. Canadian Nuclear Laboratories included in the Environmental Impact Statement a summary of Sagkeeng First Nation's Alternative Means Assessment and explained how Canadian Nuclear Laboratories has considered and used the report. Canadian Nuclear Laboratories respects the importance of this issue to Sagkeeng First Nation and subsequently supported Sagkeeng First Nation to undertake their own Alternative Means Assessment; one that assessed and measured the alternatives based only on Sagkeeng First Nation values.

Psychosocial Impacts

Sagkeeng First Nation and the Manitoba Métis Federation have expressed concerns that the Whiteshell Reactor 1 in situ disposal option is likely to have incremental adverse psychosocial effects on their membership and citizens, greater than those from other alternative decommissioning means. Canadian Nuclear Laboratories and Atomic Energy of Canada Limited recognized the findings of Sagkeeng First Nation's Psychosocial Impact Assessment Report; more specifically, that the current proposal for in situ disposal is Sagkeeng First Nation's least preferred option from a psychosocial impact perspective. Canadian Nuclear Laboratories is committed to working collaboratively with Sagkeeng First Nation and the Manitoba Métis Federation on developing and implementing the initiatives that will help address their concerns in this area.

Waste Management

The First Nations and Manitoba Métis Federation were interested to know how much radioactive waste would remain on the Whiteshell Laboratories site, which material will be sent to Chalk River Laboratories for disposal, and how it will be transported. In response, Canadian Nuclear Laboratories informed Sagkeeng First Nation that all waste materials (radioactive and non-radioactive) are sorted, verified, and transported using licensed containers, depending on the waste type, to a licensed hazardous waste management facility. Canadian Nuclear Laboratories also explained that radioactive material has been transported between Canadian Nuclear Laboratories' Whiteshell Laboratories site and Chalk River Laboratories site for many decades without a single radiological incident. Transportation of radioactive materials is a highly regulated activity that must meet the stringent requirements of both Transport Canada and the Canadian Nuclear Safety Commission.

CNL participated in community meetings with Black River First Nation, Hollow Water First Nation, and Brokenhead Ojibway Nation where waste management was discussed and provided the following information that all waste materials are sorted, verified and transported using licensed containers, and depending on the waste type, to a licensed hazardous waste management facility. Radioactive materials will be shipped in licensed waste containers.

CNL hosted Wabaseemoong for a tour of their waste management facilities and answered questions about waste management and transportation of waste. CNL provided information to the community on waste management at the site and proposed plans for waste transportation.

The MMF and CNL held meetings with a similar focus on waste management, particularly in the context of WR-1 alternatives. CNL also facilitated awareness of CNL's waste management practices in July 2020, when the Manitoba Métis Federation were on site at WL to observe a waste shipment from pre-job to completion of loading.

Historical Siting and Operations of the Whiteshell Laboratories Site

The First Nations and the Manitoba Métis Federation identified concerns regarding the lack of engagement during the siting and operations of the Whiteshell Laboratories site which began in the early 1960s. While this is out of scope of the Whiteshell Reactor 1 assessment, Canadian Nuclear Laboratories has acknowledged this concern, and recognizes historical siting remains relevant to ethical relations with the First Nations and the Manitoba Métis Federation in the present. The EIS provides information on traditional land use by First Nations and the Red River Metis and includes discussion of impacts on communities as a result of the establishment of the WL site.

Valued Components

Canadian Nuclear Laboratories reviewed and considered information collected through public and Indigenous engagement activities with Sagkeeng First Nation, the Manitoba Métis Federation, Brokenhead Ojibway Nation, Black River First Nation, Hollow Water First Nation, and Wabaseemoong Independent Nations in the selection of valued components. In addition, four Traditional Knowledge and Land Use Studies for the Whiteshell Laboratories site were completed by First Nations and the Red River Métis and shared Canadian Nuclear Laboratories for inclusion in the Environmental Impact Statement.

Sagkeeng First Nation suggests that the draft Environmental Impact Statement has neglected to consider the full scope of Sagkeeng First Nation's valued components within its assessment, which are necessary for the continued practice of Sagkeeng First Nation culture and livelihoods.

Canadian Nuclear Laboratories developed and verified a list of valued components for each community based on their Traditional Knowledge and Land Use Studies and feedback during engagement. These valued components

were used to validate the Project's valued components. Where information was provided by the First Nations and the Red River Métis, Canadian Nuclear Laboratories included a list of relevant Indigenous valued components and demonstrated how they were considered in the discipline assessment. Most of the valued components identified through Indigenous and public engagement activities are already represented by the valued components selected for the environmental assessment.

Winnipeg River

The Winnipeg River is an important location for traditional land and resource use and therefore is of primary concern to First Nations and the Red River Métis. Canadian Nuclear Laboratories indicated that the Winnipeg River was included as a valued component, and potential effects on it are considered in the Environmental Impact Statement. Canadian Nuclear Laboratories has also committed to work with First Nations and the Red River Métis to better understand their concerns over the Canadian Nuclear Laboratories monitoring program, interest in participating in the current and future, Canadian Nuclear Laboratories or Indigenous led monitoring programs, and to incorporate Traditional knowledge into existing programs and develop approaches that encourage the building of trust in the monitoring activities.

Accidents and Malfunctions

The First Nations and the Manitoba Métis Federation expressed concerns about past releases to the environment from the Whiteshell Laboratories site and the potential for future releases of hazardous and radioactive material into the Winnipeg River.

Canadian Nuclear Laboratories provided information on the topic of accidents to communities and explained that radioactivity levels in Whiteshell Reactor 1 are similar to other reactors that have gone through the in situ disposal process. When the facility was shut down in 1985, all fuel and liquids were safely removed from the reactor, and what remains in place today are the structural components of the reactor. With respect to the rest of the Whiteshell Laboratories site, all radioactive waste at the site is safely and securely stored in the site's Waste Management Area. Any events that occurred in the past were reported to the Canadian Nuclear Safety Commission.

Recognizing that accidents and malfunctions will continue to be an area of interest for the communities, Canadian Nuclear Laboratories has put in place a forum to discuss and further address this area of interest. Without close engagement within the communities since 2019, it is unlikely that most community members are aware of the available information that Canadian Nuclear Laboratories has produced regarding historical releases. Further work is needed to translate and share this information with community members. Canadian Nuclear Laboratories will continue to engage the communities on this matter.

Incorporation of Traditional Knowledge

The First Nations and the Manitoba Métis Federation noted the importance of incorporating traditional and cultural perspectives into the Project and identified specific traditional uses in proximity to the Project and the larger Whiteshell Laboratories site. Canadian Nuclear Laboratories with support from the Canadian Nuclear Safety Commission, funded the completion of four Traditional Knowledge and Land Use Studies (i.e., the Sagkeeng First Nation, the Manitoba Métis Federation, the Wabaseemoong Independent Nations, and the Black River First Nation, Brokenhead Ojibway Nation and Hollow Water First Nation). Canadian Nuclear Laboratories has incorporated information from the Traditional Knowledge and Land Use Studies into the draft Environmental Impact Statement. Canadian Nuclear Laboratories also partnered with Sagkeeng First Nation and funded the Manitoba Métis Federation to complete traditional food consumption studies helping Canadian Nuclear

Laboratories confirm that the Harvester model is a conservative model for modern day Indigenous people that rely on harvesting for some of their food.

Business and Employment Opportunities

The First Nations and the Manitoba Métis Federation were interested to know more about Canadian Nuclear Laboratories' procurement policies and potential economic participation opportunities associated with the Project and the overall Whiteshell Laboratories Restoration Project, including employment and contracting qualifications. Priority employment and contracts and capacity building were identified as an important concern and area of interest for First Nations and the Red River Métis. Sagkeeng First Nation also raised the possibility of a certain percentage of the work going to Indigenous companies. Brokenhead Ojibway Nation, Hollow Water First Nation, Black River First Nation and Wabaseemoong Independent Nations expressed concern that they would not be competitive with larger businesses in the tender process.

To help address these concerns, Canadian Nuclear Laboratories worked to enhance options to better match these Nation's capabilities with their contracting needs including adding provisions to its procurement process that encourages the use of Indigenous-owned businesses or businesses that employ Indigenous People. Canadian Nuclear Laboratories discussed the need for better information sharing regarding the procurement and contracting opportunities and asked for specific capabilities that communities have related to the Project. To help facilitate information sharing, capabilities, and opportunities, Canadian Nuclear Laboratories also hosted three "Industry Days" events to connect businesses with participating First Nations and the Red River Métis.

Future Land Use and Tenure for the Whiteshell Laboratories Site

The First Nations and Manitoba Métis Federation were interested in knowing if the land currently occupied by the Whiteshell Laboratories site would be available for other uses in the future. Sagkeeng First Nation also requested that all site clean-up and release criteria and deviation of the desired end-state(s) for the Whiteshell Reactor Disposal Facility be developed collaboratively with Sagkeeng First Nation. In addition, Sagkeeng First Nation requested to be more involved in the drafting and implementation of plans for the duration of decommissioning and into the institutional control period.

Canadian Nuclear Laboratories is committed to engaging bilaterally with Sagkeeng First Nation and other First Nations, the Manitoba Métis Federation, local communities, and stakeholders to co-develop future land use objectives, as well as engage on the end-state of the Whiteshell Laboratories site as part of Whiteshell Laboratories Restoration Project. Canadian Nuclear Laboratories also provided information on the community regeneration partnership that was formed to develop both nuclear and non-nuclear opportunities for the Whiteshell Laboratories site after the site is decommissioned. Canadian Nuclear Laboratories participates in and supports the partnership and has invited each Indigenous Nation to join.

Participation in Environmental Monitoring

The First Nations and Red River Métis expressed an interest in learning about future monitoring of the site. In particular, the First Nations and Red River Métis would like to see more opportunities for participation in environmental monitoring program development and implementation, beyond simply observation. Sagkeeng First Nation also expressed concerns about the lack of Traditional knowledge input into the environmental monitoring program and explained that Indigenous environmental monitoring was a critical element of Sagkeeng First Nation stewardship and Indigenous-led risk communication with members.

Canadian Nuclear Laboratories has committed to work with all communities to better understand their concerns over the monitoring program, interest in participating in the monitoring programs, and to incorporate Traditional knowledge into existing programs and develop approaches that encourage the building of trust in the monitoring activities. Canadian Nuclear Laboratories committed to supporting long-term Indigenous monitoring and taking a distinctions based approached working bi-laterally with each Nation to ensure their interest in environmental monitoring are met.

Summary of Indigenous Concerns

The feedback from Indigenous Nations on issues and concerns has been incorporated into the Environmental Impact Statement where applicable. Canadian Nuclear Laboratories has taken steps to verify that issues and concerns expressed by First Nations and the Manitoba Métis Federation have been correctly documented and that information provided by the Nation are correctly described and captured in the revised Environmental Impact Statement and supporting documents. Canadian Nuclear Laboratories appreciates all feedback received to date on the Project and remains committed to continuing discussions with First Nations and the Manitoba Métis Federation after submission of the updated Environmental Impact Statement, throughout the remaining environmental assessment steps, and during the remediation of the Whiteshell Laboratories site.

As Canadian Nuclear Laboratories is undertaking closure of the Whiteshell Laboratories site in addition to the Project, it is important to the First Nations, the Manitoba Métis Federation and Canadian Nuclear Laboratories that these relationships endure, grow, and adapt to future activities. Canadian Nuclear Laboratories is working to create mechanisms to develop and implement initiatives that will help address each Nation's unique interests and concerns related to the Project and the Whiteshell Laboratories Restoration Project.

Inclusion of Traditional Knowledge and Influence of Indigenous Engagement Feedback on the Environmental Assessment

Traditional knowledge influenced the environmental assessment for the Project. Traditional knowledge includes both traditional knowledge and feedback gathered through engagement and community-led studies. Traditional knowledge was primarily gathered through the Traditional Knowledge and Land Use Studies, which were completed to further enable opportunities to collect and include traditional knowledge into the environmental assessment and the Environmental Impact Statement by better understanding modern and traditional land and resource use near the Whiteshell Laboratories site. Four Traditional Knowledge, land use and occupancy studies for the Whiteshell Laboratories site were completed and shared with Canadian Nuclear Laboratories for inclusion in the Environmental Impact Statement.

The key interests and concerns raised by Sagkeeng First Nation; the Manitoba Métis Federation; Brokenhead Ojibway Nation, Black River First Nation, and Hollow Water First Nation; and Wabaseemoong Independent Nations have been assembled from a number of sources provided by the community to Canadian Nuclear Laboratories. Sources of information include formally submitted comments to the Canadian Nuclear Safety Commission as part of the environmental assessment process, comments and questions sent to Canadian Nuclear Laboratories regarding the Project, summaries of topics that have been discussed between Canadian Nuclear Laboratories and each Indigenous community at meetings, site tours, workshops, benchmarking trips, and the Traditional Knowledge and Land Use Studies. For each interest and concern, Canadian Nuclear Laboratories has included references to sections of the Environmental Impact Statement relevant to addressing the Nation's interest or concern.

Canadian Nuclear Laboratories developed and verified a list of valued components for each community based on their Traditional Knowledge studies and feedback during engagement. These valued components were used to validate the Project's valued components. In each assessment section of the Environmental Impact Statement, Canadian Nuclear Laboratories included a list of relevant Indigenous valued components and demonstrated how they were considered in the assessment. Most of the valued components identified through Indigenous and public engagement activities are already represented by the valued components selected for the environmental assessment. Moose was identified as an important species to the First Nations and the Red River Métis and was subsequently added as a valued component in the Ecological Health Assessment. In addition, Traditional Knowledge and Land Use Studies identified that Indigenous Nations harvest wild rice and medicinal plants. As such, weekay was added to the diet of a Harvester in the Human Health Assessment.

To incorporate input from the First Nations and the Red River Métis, the local and regional study areas for the Land and Resource Use valued component was expanded to capture Indigenous land and resource use within proximity of the Whiteshell Laboratories site and on either side of the Winnipeg River from Whiteshell Laboratories to Lake Winnipeg. Expansion of the local and regional study areas was also warranted in the socio-economic assessment as the relationship between traditional land and resources use has linkages to the Red River Métis' and the First Nations' well-being. The boundaries for the study areas are designed to quantify baseline conditions at a scale that is large enough to assess to maximum predicted geographic extent of direct and indirect effects from the Project on valued components and the Project in combination with previous, existing, and reasonably foreseeable developments.

The Traditional Knowledge and Land Use Studies further enabled opportunities to collect and incorporate Traditional Knowledge into the description of the environment. These studies are intended to document traditional use around the Project, local, and regional study areas. The 'Description of the Environment' section in the discipline assessments has been updated to include a description of how traditional land and resource use activities have changed in response to past historical events and external pressures, where available.

Traditional Knowledge and Indigenous engagement feedback also identified linkages between components of the environment that support traditional way of life, traditional land and resource use, and harvesting rights. These linkages provide a more holistic understanding of the environment and relationships between different components, including continued practice of Indigenous culture and livelihoods. Feedback from Indigenous engagement was also considered in the evaluation of the pathways. For example, a pathway may be evaluated as a secondary pathway due to their importance to Indigenous people even if there are no direct or indirect effects on a valued component.

Indigenous engagement feedback is reflected in Canadian Nuclear Laboratories' commitments to participation in environmental monitoring by the Indigenous Nations. Canadian Nuclear Laboratories will be updating the existing Whiteshell Laboratories Site Environmental Assessment Follow-up and Monitoring Program to suit the ongoing needs of the Project, stakeholders and Indigenous Nations. Canadian Nuclear Laboratories recognizes that the First Nations and the Red River Métis are holders of traditional knowledge and stewards of the land who have a great interest in participating in monitoring at Whiteshell Laboratories site. As such, ongoing engagements and commitments to support meaningful discussion on the monitoring and follow-up program and how each Nation and the Red River Métis wishes to be involved in future monitoring of the site will be included in the program. Canadian Nuclear Laboratories has committed to engaging with each Nation and the Red River Métis on their specific interests and concerns regarding monitoring for the Project and the existing Whiteshell Laboratories Site Environmental Assessment Follow-up and Monitoring Program.

Public Engagement

Engagement with the public and stakeholder representatives is a key component of the environmental assessment process. Canadian Nuclear Laboratories operates a Public Information Program to inform the public (i.e., general public, as well as stakeholder representatives) about ongoing activities at Canadian Nuclear Laboratories sites and the potential effects of these activities on the public. Engagement activities for the Project have been completed under the guidance of this program. This Public Information Program forms the basis of communication efforts with the public and helps to direct the establishment of long-term, mutually beneficial working relationships with the communities in proximity to Canadian Nuclear Laboratories sites. Engagement activities for the Project have been completed in accordance with this program.

The public engagement and communications activities have included numerous presentations, webinars and Q&A sessions, publicly available reports and brochures, information sessions around the region with one on one discussions and questions, technical workshops and use of social media. Public feedback continues to give valuable insight into what issues are important to stakeholders, enabling the Project team to respond to and incorporate the issues of the local community and the broader public into the planning and the Environmental Impact Statement. Key topics of the feedback received to date on the Project and Canadian Nuclear Laboratories' response to the feedback (using a variety of engagement methods and activities) are summarized below.

Regulatory Process

During engagement sessions, members of the public requested more information on updated timing for the review process, submittal, and commission hearing. During these sessions, members of the public were advised that the environmental assessment process requires Canadian Nuclear Laboratories to generate a thorough analysis of effects on the environment from the Project, including an Environmental Impact Statement, a decommissioning safety assessment and a post-closure safety assessment that are submitted to the Canadian Nuclear Safety Commission. All information will be available to the public and will include a meaningful public and Indigenous engagement process. The proposed Project can only proceed if it receives regulatory approvals to demonstrate safety to the environment and people.

Canadian Nuclear Laboratories is currently working with the Canadian Nuclear Safety Commission to establish a revised schedule for final regulatory submittals, including the submission date for the final Environmental Impact Statement. Canadian Nuclear Laboratories has received comment submissions from members of the public and regulatory bodies on the draft Environmental Impact Statement. Presently Canadian Nuclear Laboratories is responding to those submissions and, subject to their acceptance by the Canadian Nuclear Safety Commission, Canadian Nuclear Laboratories will update and finalize the Environmental Impact Statement. The adjustment to the schedule is being made to allow Canadian Nuclear Laboratories to appropriately address these comments and for the Canadian Nuclear Safety Commission staff to subsequently conduct a fulsome assessment of Canadian Nuclear Laboratories' proposal.

Alternative Means Assessment

Canadian Nuclear Laboratories presented the alternatives that were both technically and economically feasible at all the public engagements and explained to the members of the public that these options were assessed for their environmental effect, socio-economic effect, and human health effects.

Members of the public asked Canadian Nuclear Laboratories to provide further detail on how the in situ disposal method was chosen for the Project. In accordance with guidance from the Canadian Environmental Assessment

Agency, the original Environmental Impact Statement included qualitative assessments of the options considered. In response to requests, Canadian Nuclear Laboratories revised the assessment of alternatives for clarity, and to incorporate feedback from the public, the First Nations and the Red River Métis. The updated assessment clarifies the differences between the alternatives and explains the risks relative to each alternative. Based on this assessment, in situ disposal is Canadian Nuclear Laboratories' preferred option and is of low risk to the public and the environment when compared to the limits established by Canada's nuclear regulator, the Canadian Nuclear Safety Commission.

Complete removal of the Whiteshell Reactor 1 was the decommissioning method described in the Comprehensive Study Report approved by the Canadian Nuclear Safety Commission in 2002. Since then, Canadian Nuclear Laboratories has continued to re-evaluate that plan considering international best practice to reduce deferment periods. The Canadian regulations have adopted specific conditions for when in situ disposal of a legacy facility would be acceptable, the conditions of which the Project meets. The in situ disposal option is a safe decommissioning option for the reactor with respect to the environment, workers and the public and has been used successfully for over six decades in other parts of the world.

Lessons Learned

Members of the public wanted assurance from Canadian Nuclear Laboratories that the Project was properly incorporating available lessons learned from other similar work already conducted and work done at the Whiteshell Laboratories site. Canadian Nuclear Laboratories has gathered data and lessons learned where available on other in situ projects. In addition, Canadian Nuclear Laboratories has participated in several learning workshops with technical experts that have performed in situ disposal and has used services and advisement from organizations that have performed the in situ method. Development of the grout formulation incorporated lessons learned from the Savannah River National Laboratory's reactors in situ grouting. Lessons learned documents from previous decommissioning work, including operating experience were reviewed as part of assessing the potential for accidents and malfunctions. Canadian Nuclear Laboratories recognizes the incredible depth of research on waste storage that was carried out at the Whiteshell Laboratories site and has been incorporating that research into the assessment for the Project. Gathering and incorporating Lessons Learned will be an important part of the detailed work planning activities prior to starting the work.

Design and Engineering Details

Many questions from the public were about the design of the Project. When Canadian Nuclear Laboratories submitted the draft Environmental Impact Statement, it had completed a preliminary conceptual design. Since then, the design process has continued to progress, and more refined designs have been prepared for the re-submission of the updated Environmental Impact Statement. The final detailed design will equal or surpass the performance of the conceptual design that was assessed in the Environmental Impact Statement.

Canadian Nuclear Laboratories also received questions about the International Atomic Energy Association's safety standard for decommissioning, which states that in-situ disposal is not a suitable option for all nuclear facilities and should be considered only under certain conditions. Canadian Nuclear Laboratories agrees with this assessment, and Canadian Nuclear Laboratories determined the Whiteshell Reactor 1 has features that make it suitable for long-term disposal such as: it is located below grade, it does not contain significant quantities of long-lived isotopes, and it can be monitored post-closure during the institutional control period.

The Canadian regulations (Canadian Nuclear Safety Commission Regulatory Document REGDOC 2.11.2 *Decommissioning* and Canadian Standards Association Standard N294 *Decommissioning of facilities containing*

nuclear substances) have adopted specific conditions for when in situ disposal of a legacy facility would be acceptable, the conditions of which the Project meets. Canadian Nuclear Laboratories is following International Atomic Energy Association safety standards for the decommissioning of the facility and more importantly is also following the International Atomic Energy Association safety standards for waste disposal, since the facility – in its end state – would be classified as a disposal site.

Effectiveness of the Grout

Since Canadian Nuclear Laboratories has identified in situ disposal as the preferred option for decommissioning the Whiteshell Reactor 1 facility, the use of grout to fill the building below-grade has prompted many questions from the public on the topics of grout properties, installation process and long-term durability. Canadian Nuclear Laboratories has developed specially-formulated grout based on the requirements of the Whiteshell Reactor Disposal Facility. A similar grout design process (where an existing formula was adapted to use local materials) has already been successfully performed by Canadian Nuclear Laboratories. The grout formulation has been designed and evaluated through a testing program to validate its performance against the required and assumed properties, to confirm it performs as well as or better than estimated in the solute transport model, prior to the installation of any grout into the Whiteshell Reactor 1.

The primary purpose of grouting of the facility is to stabilize the structure and resist subsidence over time. But additionally, grouting has a twofold benefit: 1) it slows down the process which will corrode the system components, extending their lifetime as the initial barrier to containment, and 2) it slows the movement of contamination from outside of the system components, as well as contamination from the degraded system components. The safety case of the proposed in situ disposal does not currently require that the reactor vault be grouted. The existing structure provides sufficient barrier to releases, and additional grout would not considerably increase the effectiveness of that barrier. The safety case for the Whiteshell Reactor Disposal Facility is built on the conservative assumption that the only major aspect of the grout to its function as a barrier is the hydraulic conductivity of grout used in the groundwater flow model. Effectiveness of the grout and concrete materials used for the in situ disposal system have been evaluated through the sensitivity analyses carried out as part of the Project assessment modelling.

Radiological Inventory

Canadian Nuclear Laboratories received several requests for details on the current radiological content of the Whiteshell Reactor 1 facility and how the levels of radioactivity will reduce over time. It should be noted that the reactor fuel – the most radioactive part of the facility – was removed in 1985. In response to questions, Canadian Nuclear Laboratories has conducted further characterization of the facility and included the results in the updated Environmental Impact Statement.

Valued Components

Canadian Nuclear Laboratories surveyed attendees at public open house events to solicit input into the valued components selected for the Project. Canadian Nuclear Laboratories provided information handouts at public open houses, and created posters displaying the proposed valued components. The public was given the opportunity to identify new valued components through a questionnaire that was offered to visitors. Public feedback on the valued component selection included comments and questions about the Winnipeg River (water quality) valued component and the future land use at the Whiteshell Laboratories site (which is captured by the Traditional Land and Resource Use and Other Land and Resource Use valued components).

Canadian Nuclear Laboratories considered all suggested valued components and either added them to the assessment, determined they were effectively covered by existing valued components or provided rationale for why the valued component was not included in the assessment. Both the Winnipeg River and Land Use are represented in the Environmental Impact Statement as specific valued components.

Protecting the Winnipeg River

The Winnipeg River was a key concern for the members of the public. Canadian Nuclear Laboratories confirmed that the Winnipeg River is a valued component and that the continued protection of the Winnipeg River is a key focus of the Environmental Impact Statement. Water quality, flow, recreational use, and fish and fish habitat were considered in the assessment. For the post-closure phase, an Ecological Risk Assessment was completed to evaluate the potential for adverse effects on aquatic health associated with exposure to chemical and radiological contaminants from the Project in the long-term. There are no exceedances of the radiation benchmark for the aquatic biota in the Winnipeg River and all predicted doses are well below this level. Therefore, it is unlikely there would be significant adverse effects on aquatic populations or communities as a result of radionuclide releases in the long-term during the post-closure phase.

Canadian Nuclear Laboratories will implement an Environmental Assessment Follow-up and Monitoring Program for the Project that will be integrated with the existing Environmental Assessment Follow-up and Monitoring Program for the Whiteshell Laboratories site. The purpose of the Environmental Assessment Follow-up and Monitoring Program for the Project is to verify the accuracy of environmental effects and determine the effectiveness of mitigation measures that have been implemented.

Effects of the Environment on the Project

Members of the public expressed concerns about the potential effects of an earthquake, climate change or other natural disasters on the Whiteshell Reactor 1. Canadian Nuclear Laboratories explained that an assessment was completed that evaluated the potential effects of natural hazards (i.e., extreme weather events, forest fires and seismic events) and climate change on the Project. The Project design includes environmental design features, management practices and other mitigation to reduce the risks from natural hazards and climate change. In addition, a seismic hazard analysis was completed for the Whiteshell Laboratories site, which concluded that a 1-in-10,000 year earthquake would not likely cause damage to the Whiteshell Reactor Disposal Facility. To provide further confidence, Canadian Nuclear Laboratories modelled a scenario where the concrete foundation of the Whiteshell Reactor Disposal Facility failed. This scenario did not result in adverse effects to human and ecological receptors.

Contingency Planning

Members of the public requested information on how the Project design accounts for the risk that in situ does not operate as planned. Canadian Nuclear Laboratories explained that the Whiteshell Reactor Disposal Facility will include multiple barriers, including the waste form, a specialized grout formulation, the existing the Whiteshell Reactor 1 facility walls, a concrete cap and engineered cover, and the surrounding geosphere. In the very unlikely case that degradation of these barriers occurs earlier than predicted, the surface and ground water monitoring system will detect contamination migration.

Canadian Nuclear Laboratories will implement an Environmental Assessment Follow-up and Monitoring Program for the Project that will be integrated with the existing Environmental Assessment Follow-up and Monitoring Program for the Whiteshell Laboratories site. The Environmental Assessment Follow-up and Monitoring Program for the Project will include sufficient information on the type, quantity and quality of information required to reliably

verify effects predicted by the environmental assessment and confirm the effectiveness of mitigations. If the Environmental Assessment Follow-up and Monitoring Program identifies that adverse environmental effects are greater than predicted, then Canadian Nuclear Laboratories will evaluate the need for revised mitigation actions and management practices to manage effects, with engagement with the public for openness and transparency. Where the need for revised mitigations is identified, they will be developed and implemented. Any proposals on modifications to the monitoring program will be communicated to the Canadian Nuclear Safety Commission.

Environmental Monitoring

Members of the public requested information on how the in situ design incorporates ongoing environmental monitoring. Canadian Nuclear Laboratories explained that the Environmental Assessment Follow-up and Monitoring Program developed for the Project will be integrated with the existing Environmental Assessment Follow-up and Monitoring Program for the Whiteshell Laboratories site. The Program serves to evaluate the risk to relevant human and non-human biota receptors resulting from exposure to contaminants and stressors related to the Whiteshell Laboratories site and its activities, and recommends further monitoring (the Effluent Monitoring Verification Program, Groundwater Monitoring Program, and the Environmental Monitoring Program) or assessment as needed based on the results, to clarify risks or reduce uncertainties identified in the recommended assessment. The Environmental Assessment Follow-up and Monitoring Program for the Project will include sufficient information on the type, quantity and quality of information required to reliably verify effects predicted by the environmental assessment and confirm the effectiveness of mitigations. Wherever possible, existing programs will be adapted to meet the objectives of the Environmental Assessment Follow-Up and Monitoring Program for the Project.

Canadian Nuclear Laboratories explained that if the environmental assessment produces a positive decision on the Project, Canadian Nuclear Laboratories will work with Canadian Nuclear Safety Commission to enhance and finalize the Environmental Assessment Follow-up and Monitoring Program for the Project and will also engage local municipal governments and other regulator agencies.

Interest was also expressed in the depth of monitoring wells. Depths and location of monitoring wells was explained and talked about in public presentations. Canadian Nuclear Laboratories has committed to adding additional ground monitoring well(s) between the Whiteshell Reactor 1 and the Winnipeg River as requested by the Red River Métis.

Future Land Use and Economic Opportunity

Members of the public expressed concern with the Project because it would limit the types of businesses and industries that could use the Whiteshell Laboratories site for future operations and therefore reduce the number of economic development opportunities available to them. This is a major concern for local communities who have considered the operation of the Whiteshell Laboratories site as an important economic contributor in the region, as expressed through the desire to recruit a new industry to the site.

Canadian Nuclear Laboratories is currently working with the communities and rural municipalities in the local area by supporting the activities of the Community Regeneration Partnership. The goal of the Whiteshell Laboratories Community Regeneration Partnership is to develop a socio-economic plan for the region. Canadian Nuclear Laboratories supported drafting of the regional socio-economic plan through the provision of in-kind resources and services. The public expressed hope that activities through the Community Regeneration Partnership would replace the employment lost at the Whiteshell Laboratories site with stable, high quality employment in the region. Although uncertainty remains about the timing and nature of a new industry being attracted to the site, there has

already been interest expressed to develop the site for alternative uses. Canadian Nuclear Laboratories will continue to support/facilitate these discussions and potential opportunities moving forward through ongoing engagement, relationship-building, partnerships and collaboration with local communities and Indigenous nations.

Future uses and zoning for the Whiteshell Laboratories site have not been determined. Although a small proportion of the Whiteshell Laboratories site will have restrictions on use because of the Project, it is still anticipated that the majority of the site will be safe and appropriate for unrestricted use, and that future designations will seek to maximize the amount of land available for other uses. Canadian Nuclear Laboratories will share information regarding future uses and access to the Whiteshell Laboratories site with the Community Regeneration Partnership as it becomes available. Canadian Nuclear Laboratories will also support robust communication of environmental monitoring results to confirm the safety of the Whiteshell Laboratories site and help address concerns and mitigate concerns about the site's suitability for future uses. These commitments have been included in Section 6.9 Socio-economic Environment.

Environmental Assessment Approach

The environmental assessment approach for the Project was developed to meet the requirements of *Canadian Environmental Assessment Act, 2012* and the Generic Environmental Impact Statement Guidelines developed by the Canadian Nuclear Safety Commission, which provide an outline of the information to be included, along with a high-level description of the methods to be implemented for the environmental assessment.

The assessment started with defining the overall scope of the assessment including identifying the valued components and defining spatial (i.e., study areas) and temporal (i.e., time-related phases of the Project) boundaries and assessment cases used to evaluate effects.

The next step was to describe the existing conditions. A description of the environment subsection was developed for each environmental component and includes a description of the baseline conditions. Canadian Nuclear Laboratories has helped to fund four Traditional Knowledge and Land Use Studies with six Indigenous Nations to understand traditional rights-based activities such as traditional harvesting. Information from these Traditional Knowledge and Land Use Studies has been summarized and included in the description of the environment for disciplines, where available.

Potential effects of the Project on the environment were then identified and mitigation was developed to reduce adverse effects on the environment. Residual effects (i.e., effects that remain after the application of mitigation) were classified (e.g., low to high magnitude, short-term duration) so that it could be determined if each residual effect was significant or not. Cumulative effects (i.e., the combined impact of the Project with other reasonably foreseeable developments) were also evaluated to determine significance of these effects. Any uncertainty in the assessment and the general confidence in the predictions from the assessment were also discussed. Finally, monitoring and follow-up programs were proposed to verify the predictions and assumptions from the environmental assessment and to confirm that the proposed mitigation is effective.

Atmospheric Environment Assessment

Air Quality

Air quality was selected as a valued component as there is a potential for the Project activities to release air emissions that could affect the local air quality. The measurement indicators for air quality include changes in

ambient concentrations of indicator compounds in comparison to the provincial or federal ambient air quality criteria.

The Whiteshell Laboratories site is located in a rural area, with very few industrial emission sources that influence the air-shed surrounding the site. The existing concentrations of indicator compounds for air quality are below the respective provincial and federal criteria for each indicator compound, suggesting that the region has generally good air quality.

Project activities will result in emissions associated with the operation of vehicles and equipment, as well as material handling emissions from the demolition and grouting and temporary batch mixing plant or similar equipment. Mitigation practices to limit predicted residual effects to air quality during the closure phase are available, including:

- implementation of Canadian Nuclear Laboratories' Environmental Protection Program and Procedure for Management and Monitoring of Emissions, which includes operational control monitoring, air verification monitoring and environmental monitoring;
- implementation of dust management techniques;
- on-site vehicles and equipment engines will meet a minimum of Tier 3 emission standards, where possible, and be maintained in good working order;
- limit idling of vehicles on-site and limit speed on roads; and
- use of enclosures for raw material handling.

Air quality is predicted to be affected by the Project. Fugitive dust from vehicle movement on paved roads is the largest contributor to suspended particulate matter emissions, particles nominally smaller than 10 micrometres in diameter and particles nominally smaller than 2.5 micrometres in diameter. Non-road equipment exhaust emissions are the largest contributors to oxides of nitrogen and carbon monoxide emissions. Finally, the largest contributor to sulphur dioxide is fuel combustion for emergency power generators. Predicted concentrations for the Application Case are below applicable air quality guidelines and/or standards, with the exception of SPM and PM_{10} limited to a small area just outside the LSA and contained within the RSA, along Ara Mooradian Way north of 211 Rd in a restricted area. Overall, the residual adverse effects from the Project on air quality was determined to be not significant.

Greenhouse Gas Emissions

Climate change was selected as a valued component for the greenhouse gas assessment as there is a potential for the Project activities to release greenhouse gas emissions that could contribute incrementally to climate change. The measurement indicators considered in the climate change assessment include changes in concentrations of carbon dioxide, methane, and nitrous oxide.

Project activities will result in greenhouse gas emissions associated with the operation of vehicles and equipment. The greenhouse gas emissions are estimated to be less than 0.1% of the total provincial greenhouse gas emissions and less than 0.01% of the total national greenhouse gas emissions. Based on the comparison between the estimated annual emission to both the federal and provincial greenhouse gas emissions, the Project will result in minor releases of greenhouse gases, but is predicted to have a negligible residual effect on climate change and

will not impact Canada's emission reduction efforts. Therefore, any greenhouse gas emissions from the Project may be considered negligible on a global scale.

Geologic and Hydrogeologic Assessment

Geology

Geology, which includes bedrock, soils and geomorphology, is recognized as an important component of the environment that may be affected by the Project. Acknowledging that changes to geology could lead to effects on other valued components, geology is referred to as an intermediate valued component (i.e., it does not have an assessment endpoint). The measurement indicators for geology include changes in soil quality, soil quantity, bedrock and geomorphology.

The overburden geology in the region consists of glaciofluvial tills and outwash deposits and glacial lacustrine deposits associated with Glacial Lake Agassiz. Surficial deposits can be up to 25 metres thick. In the area surrounding the Winnipeg River, these deposits have been subdivided into four main stratigraphic units, arranged lowest to highest from bedrock: glacial till, glacio-lacustrine clay, transitional glacio-lacustrine clay and glaciofluvial and glacio-lacustrine sandy silt. Overburden layers are supported by the Lac du Bonnet batholith, which underlays the majority of the local study area. North of the Whiteshell Laboratories main campus, bedrock lithology has been characterized based on borehole observations. The bedrock is predominately a medium- to coarse-grained pink granite (typical of the upper surface of the Lac du Bonnet batholith) to a depth of approximately 300 metres, where it transitions from pink granite to granodiorite.

Potential effects on geology are limited to changes in soil quantity and quality as a result of construction of temporary supporting infrastructure, and changes to soil quality from air emissions and groundwater transport from the Whiteshell Reactor Disposal Facility into the groundwater. Temporary infrastructure will be located within the Whiteshell Laboratories main campus, which is previously disturbed and developed, limiting potential effects to soil quality and quantity. Concentration of air emissions are predicted to be lower than applicable air quality guidelines/standards. The concrete cap and engineered cover will be designed to mitigate moisture infiltration into the Whiteshell Reactor Disposal Facility and hence limit leakage through the Whiteshell Reactor Disposal Facility to groundwater and subsequent changes in soil quality. Consequently, no residual effects on geology are predicted as a result of the Project.

Hydrogeology

Hydrogeology is recognized as an important component of the environment that may be affected by the Project. Acknowledging that changes to hydrogeology could lead to effects on other valued components, hydrogeology is referred to as an intermediate valued component (i.e., it does not have an assessment endpoint). The measurement indicators for hydrogeology include groundwater flow patterns and discharge rates, groundwater table elevations, and peak solute mass loadings of contaminant in groundwater to the Winnipeg River.

Groundwater flow in the unconsolidated sediments and bedrock within the region generally follows the topography, with the predominant direction of flow being from east to west. Within the Precambrian bedrock, groundwater flow occurs primarily within fractures. Based on the available information from previous hydrogeological investigations, groundwater recharge primarily occurs approximately 3 kilometres east of the Project and groundwater discharge ultimately occurs at the Winnipeg River. Horizontal hydraulic gradients were estimated based on the groundwater elevations in monitoring wells located parallel to the direction of groundwater flow. Relatively neutral gradients

were noted for the clay unit and for the combined basal sand/upper bedrock unit. Vertical gradients were calculated between the various units based on mid-point elevations of monitoring well screens. At all locations, groundwater elevations were highest in the clay unit and lowest in the combined basal sand/upper bedrock unit, indicating a downward direction of groundwater flow. Ongoing groundwater monitoring is completed at existing wells around the Whiteshell Laboratories to monitor groundwater elevations and movement.

Changes to groundwater quality from the Project due to the release of solutes into the groundwater as the grout and reactor components gradually deteriorate (post-closure) was identified as having a residual effect on the hydrogeological environment. The Winnipeg River was identified by the post-decommissioning groundwater flow model as the principal receptor of groundwater discharge. The groundwater flow modelling indicates that the mean groundwater travel times from the Whiteshell Reactor Disposal Facility to the Winnipeg River were an estimated 100 years. Ongoing groundwater sampling will be completed at specific locations around the Whiteshell Laboratories site for both radiological and non-radiological contaminants.

In 2024, groundwater flow and solute transport modelling was completed to evaluate 11 additional sensitivity scenarios (Scenarios 19 through 29) to further assess the peak loadings to the Winnipeg River. Sensitivity analyses included consideration of an enhancement to the hydraulic conductivity of the grout, a fractured flow condition in the bedrock pathway, and upper and lower bound adsorption co-efficients for the bedrock geo-pathway. The modelling indicates that the expanded set of parameter inputs results in increased mass loading estimates to the environment for some scenarios relative to those assessed in the Draft EIS submitted December 2022. The overall impact of the increased mass loadings are evaluated in the Human and Ecological Health assessment to determine the potential impact of these results on human and ecological health.

Based on the Comprehensive Study Report, it was determined that the likelihood of contaminant transport beyond the Waste Management Area was very low and no effects on groundwater were anticipated from in situ decommissioning of the trenches; therefore, no overlap with the Project is expected.

Surface Water Assessment

Hydrology

Hydrology, which includes surface water flow and drainage direction, is recognized as an important component of the environment that may be affected by the Project. Acknowledging that changes to hydrology could lead to effects on other valued components, hydrology is referred to as an intermediate valued component. The measurement indicators for hydrology include runoff rates and volumes, and drainage patterns.

The Winnipeg River is the dominant drainage feature in the area. Its drainage area is approximately 15,000,000 hectares, originating in Ontario at Lake of the Woods. There are six hydroelectric dams on the river, the closest being approximately 7.5 kilometres upstream of the Whiteshell Laboratories site. Dams store water during periods of high precipitation and release water during periods of low precipitation. This regulates the downstream flow.

The hydrology assessment considers the potential effects of the Project on the flows and water levels of the Winnipeg River. Following the completion of closure activities, the Whiteshell Laboratories site will be graded to promote drainage from the site to the Winnipeg River. Run-off control for the engineered cover is designed to limit erosion and infiltration of water into the grouted structure. This is achieved by sloping the cover surface to maintain a slope toward the edges and the collection of water by the existing surface water management systems at the Whiteshell Laboratories site. Natural runoff from the decommissioned Whiteshell Laboratories site will continue to

discharge to the Winnipeg River during the post-closure phase. Although the installation of the concrete cap and engineered cover at the Whiteshell Reactor 1 Building is expected to slightly alter the drainage rates and flow patterns; the changes are expected to be within the natural range of variation of flow in the Winnipeg River. As such, effects to hydrology are predicted to have a negligible effect on hydrology of the area.

Surface Water Quality

Surface water quality is recognized as an important component of the environment that may be affected by the Project. Acknowledging that changes to surface water quality could lead to effects on other valued components, surface water quality is referred to as an intermediate valued component. The measurement indicators for surface water quality include changes to ambient levels of surface water contaminants.

Historically, liquid effluent from the Active Liquid Waste Treatment Centre was discharged to the Winnipeg River via the process outfall located about 8 metres offshore. In 1995, the Winnipeg River Task Force looked at potential sources of Winnipeg River water quality degradation near the community of Sagkeeng. The Task Force found that Whiteshell Laboratories has not had an adverse effect on water quality in the Winnipeg River for downstream communities. The task force included members from the Sagkeeng First Nation, Environment Canada, Indian and Northern Affairs Canada and Health Canada.

As part of the routine monitoring at the Whiteshell Laboratories site, river bottom sediments were collected from 12 locations along the Winnipeg River, ranging from 0.8 kilometres upstream to 13.1 kilometres downstream of the outfall. The alpha activity in these samples is due to naturally occurring isotopes such as uranium-238 or thorium-232 and their progeny as both upstream and downstream samples contain similar levels. Gamma spectrometry of the sediment samples identified the presence of caesium-137 and potassium-40. Beta activity in the sediment samples is mostly from naturally occurring potassium-40, with a smaller amount from caesium-137. With the exception of samples from three of the twelve locations, all caesium-137 activity levels were below the detectable level.

During the post-closure phase, groundwater may encounter the Whiteshell Reactor Disposal Facility and then flow to the Winnipeg River, resulting in changes to surface water and sediment quality. The predicted maximum radionuclide concentrations in surface water at both the Nearfield and the Farm A Intake on the Winnipeg River are orders of magnitude lower than background groundwater concentrations. Predicted sediment concentrations of radionuclides are lower than their respective clearance levels.

Predicted maximum non-radionuclide concentrations in surface water and sediment are driven by current river concentrations and some parameters exceed available surface water or sediment guidelines. For example, the background concentration for lead exceeds the lowest available guidelines for surface water and sediment, but the maximum sediment concentrations at both the Nearfield and the Farm A intake in both surface water and sediment show no change from the background level as a result of the Project.

Overall, the assessment of potential effects determined there are negligible residual adverse effects on surface water and sediment quality from changes in groundwater quality.

Aquatic Environment Assessment

For the aquatic environment, fish and fish habitat was selected as a valued component as there is a potential for the Project activities to affect aquatic biota in the Winnipeg River. The fish and fish habitat valued component includes the fish species identified by the First Nations and the Red River Métis that are occurring in the Winnipeg River, as well as habitats supporting life history requirements including spawning, nursery, rearing and foraging. The measurement indicators for the aquatic environment include measurable attributes that broadly represent various facets of the aquatic environment, including fish habitat (quality and quantity), benthic invertebrate community structure and fish community structure.

The principal aquatic habitat occurring within the area is the Winnipeg River. The Winnipeg River supports a diverse fish community and affords spawning, rearing and foraging habitats. A total of 61 native species are reported for the river and two species at risk are known to be present within the vicinity of the Whiteshell Laboratories site: Lake Sturgeon (*Acipenser fulvescens*) and Carmine Shiner (*Notropis percobromus*). Fish occurring within the study reach include both resident species (present year-round) and migratory species (passing through). Canadian Nuclear Laboratories undertakes annual monitoring of radioactivity in fish flesh (muscle and tissue) collected from the Winnipeg River upstream and downstream of the Whiteshell Laboratories site.

During closure, potential effects to fish and fish habitat include the transport of site surface water runoff to the Winnipeg River in the vicinity of the Whiteshell Laboratories site, changes in drainage rates and flow patterns due to the installation of the concrete cap and engineered cover at the Whiteshell Reactor 1 Building, and deposition of air emissions from demolition activities. The Project is not anticipated to affect the physical habitat of the Winnipeg River. With Implementation of a storm water management plan and Canadian Nuclear Laboratories' Management and Monitoring of Emissions, site runoff and air and dust emissions are not predicted to impact the surrounding aquatic environment. As such, closure activities are predicted to have a negligible residual effect on fish and fish habitat.

An Ecological Risk Assessment was completed and for the post-closure phase, it evaluates the potential for adverse effects on aquatic health associated with exposure to chemical and radiological contaminant releases through the groundwater pathway from the Whiteshell Reactor Disposal Facility in the long-term. There are no exceedances of the radiation benchmark for the aquatic biota in the Winnipeg River and all predicted doses are well below this level. Therefore, it is unlikely there would be significant adverse effects on aquatic populations or communities as a result of radionuclide releases in the long-term during the post-closure phase.

There are no exceedances of the hazard quotients identified for exposure of the aquatic receptors to non-radionuclides, with the exception of benthic invertebrates in groundwater. The hazard quotients for cadmium, lead and HB-40 exceeded 1 for the scenario where benthic invertebrates are exposed directly to groundwater. The assessment conservatively assumes the organisms spend their entire lives in the peak discharge zone, and that no dilution of the groundwater occurs in the shallow sediment layers where most benthic organisms reside. Moreover, the seepage area represents a small part of the benthic community habitat, and the maximum groundwater concentration assumed represents the worst-case period. As such, a realistic benthic invertebrate population is not likely to be at risk due to cadmium, lead and HB-40 exposure, and any adverse effects will be spatially and temporally limited. Overall, the changes in water quality and sediment quality are expected to result in a negligible residual effect to the benthic invertebrate population relative to existing conditions.

Terrestrial Environment Assessment

Based on the nature of this project and limited pathways of effects on natural terrestrial ecosystems, the focus of this assessment is at a species-level and primarily focuses on wildlife species identified on Schedule 1 of the federal *Species at Risk Act*. All *Species at Risk Act* listed wildlife species that may be near the Whiteshell Laboratories site (or with confirmed occurrence records) were considered as potential valued components. Five species at risk were selected as valued components (little brown myotis, northern myotis, snapping turtle, golden-winged warbler and barn swallow) due to their potential to be present within the local area. Habitat availability, habitat distribution and survival and reproduction were selected as the measurement indicators.

Traditional Knowledge and Land Use Studies and Indigenous engagement identified additional valued components (i.e., white-tailed deer, moose, elk, porcupine, furbearers, grouse, geese, ducks, and waterfowl) for consideration in the terrestrial effects assessment. Project activities occur within the Whiteshell Laboratories site on previously disturbed areas; therefore, there are no direct effects to habitat availability and distribution for the above listed species. In addition, indirect effects of the building demolition works (e.g., noise, equipment use) was deemed to be of low risk to wildlife in natural areas adjacent to the fenced campus, and they were considered to be unlikely to occur within the fenced campus. Although, these species were not selected as valued components for the terrestrial assessment, they (or representative species) were included in the effects assessment for ecological health.

Whiteshell Laboratories is located in the Boreal Shield Ecozone, Lake of the Woods Ecoregion and Stead Ecodistrict. In general, this ecoregion has a large number of forest types characterized by tall, closed stands of jack pine (*Pinus banksiana*), trembling aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*), white spruce (*Picea glauca*), eastern white cedar (*Thuja occidentalis*), black ash (*Fraxinus nigra*) and American elm (*Ulmus americana*). Terrestrial habitat at the Whiteshell Laboratories site is diverse over short distances. Large tracts of wetland cover the easterly portions of the Whiteshell Laboratories site, with black spruce common. Further to the west are poorly drained clay plains, forested land including species such as ash and poplar and unutilized farm fields vegetated with grasses and shrubs. Land closer to the Winnipeg River include gullies and ravines where beaver dams are common.

During closure, the Project will generate air and dust emissions from demolition activities. With implementation of Canadian Nuclear Laboratories' *Management and Monitoring of Emissions*, there is predicted to be negligible effects on the terrestrial environment from the Project as a result of air and dust emissions. Sensory disturbance, road mortality, and loss of nest/roost substrate also have the potential to affect terrestrial valued components during closure. Surveys during the appropriate season, to be undertaken the year prior to initiation of decommissioning activities, will confirm whether nesting and/or roosting activity is occurring in the Whiteshell Reactor 1 Building. If evidence of nesting or roosting activity is found, appropriate mitigation in the form of deterrents will be implemented, under consultation with Environment and Climate Change Canada and in accordance with habitat protection provisions and the required permitting process under the *Species at Risk Act* and potentially the *Migratory Birds Convention Act*. The objective of the selected mitigation will be to prevent birds and bats from accessing the building during the period when it will be demolished. The potential for road mortality of snapping turtle will be addressed through adaptive management and ongoing monitoring and documentation of road mortalities. If road mortality of snapping turtle occurs, additional mitigation will be enacted, as required. Following implementation of mitigation and monitoring in an adaptive management framework, there is predicted to be negligible effects on the terrestrial environment as a result of the Project.

An Ecological Risk Assessment was completed and for the post-closure phase, it evaluates the potential for adverse effects on terrestrial biota associated with exposure to chemical and radiological contaminant releases in surface water through the groundwater pathway from the Whiteshell Reactor Disposal Facility in the long-term. There are no exceedances of the radiation benchmark for terrestrial biota and all predicted doses are well below this level. There are also no exceedances of the hazard quotients identified for exposure of the terrestrial receptors to cadmium, lead, HB-40 and xylene. Therefore, changes in surface water quality through the groundwater pathway are expected to result in negligible residual effect to terrestrial populations or communities in the long-term during the post-closure phase. Because the Ecological Risk Assessment found the predicted doses would be far below any effect level, no significant effects are predicted for the valued components identified by Indigenous Nations.

Human Health Assessment

To demonstrate the safety of historical and ongoing Whiteshell Laboratories site operations, Canadian Nuclear Laboratories reports the results of the Environmental Monitoring Program for the site each year to the Canadian Nuclear Safety Commission, and makes this information available to the public. The Environmental Monitoring Program data are collected to verify that radiation doses to members of the public as a result of the operations of the Whiteshell Laboratories site meet the principle of As Low As Reasonably Achievable. The calculated radiation dose to members of the public from Whiteshell Laboratories operations in 2019 showed the radiation dose due to airborne and liquid effluent represented 0.009% of the effective dose limit of 1 millisieverts per year for members of the public.

Specific to the Project, the human health risk assessment focused on public and Indigenous Nations' health and the health of Whiteshell Laboratories site workers not involved in performing Project activities. Consistent with CSA N288.6-12, Nuclear Energy Workers directly involved in performing Project activities were not assessed because their potential doses are controlled through Canadian Nuclear Laboratories' Radiation Protection Program. The assessment for public and Indigenous Nations' health considered locations where people are known to be present. Measurement endpoints for the human health assessment include changes in air quality, groundwater quality and surface water quality.

The receptors for the human health risk assessment were selected to be appropriate for assessment of both radiological and non-radiological stressors on human health. Off-site members of the public and Indigenous Nations will potentially be exposed to low levels of airborne contaminants from decommissioning of the Whiteshell Reactor 1 Building.

The public and Indigenous receptors considered in the assessment (see Figure 5) were identified as Farm A and Farm F (year-round occupants, with livestock), an On-site Farm after the 100-year institutional control period and Harvesters (on-site and downstream). Harvesters represented traditional or Indigenous users of the area gathering local foods.

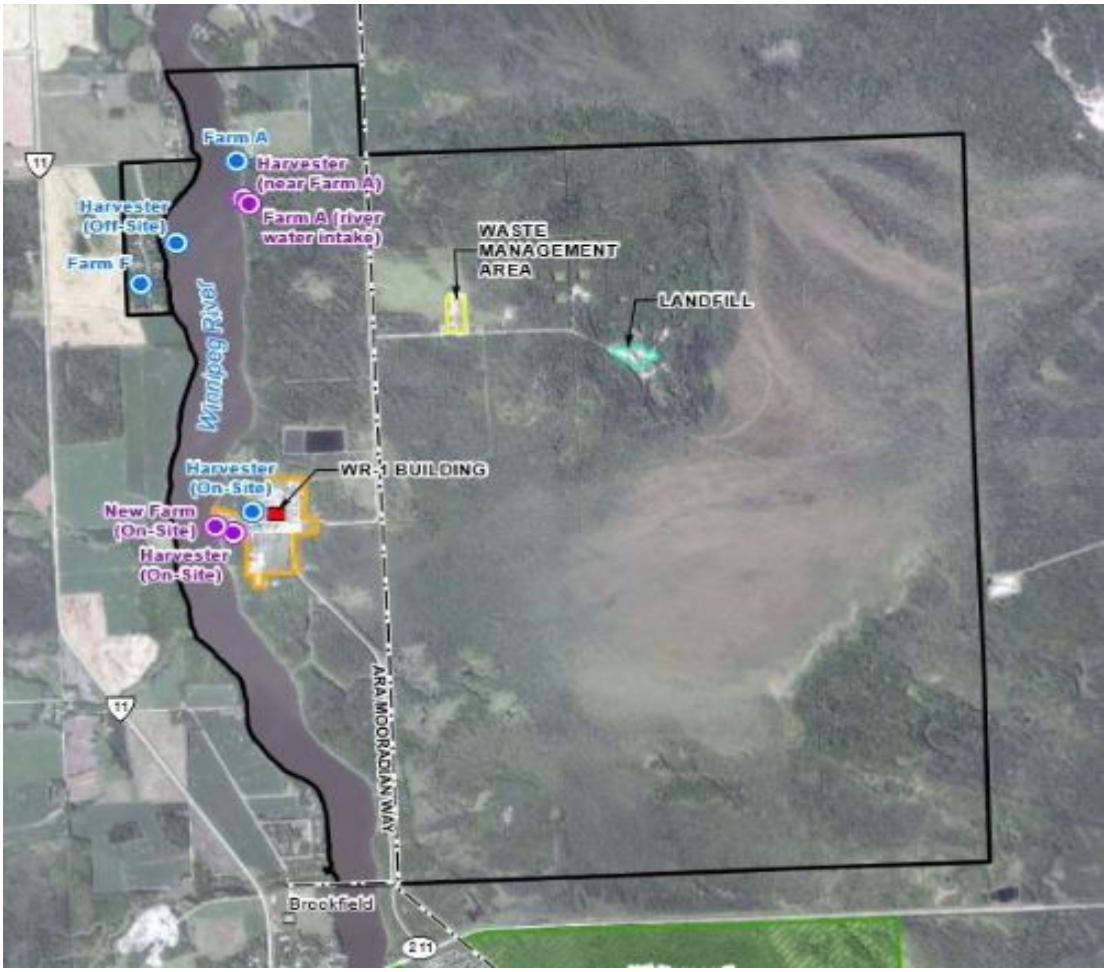


Figure 5: Locations of Assessed Receptors

For the closure phase, the relevant contaminants of potential concern are expected to be released via atmospheric releases from the Whiteshell Reactor 1 Building as reactor systems are dismantled, transported off-site or disposed of in-situ within the Whiteshell Reactor Disposal Facility. The closure activities are well encompassed by existing engineering and administrative controls currently in place at the Whiteshell Laboratories site. The calculated radiological doses for the human receptors during closure (i.e., Farm A, Farm F, and downstream Harvester) are all below the Canadian Nuclear Safety Commission public dose limit of 1 mSv/a, as well as the dose constraint for the Project of 0.25 mSv/a. Since the dose estimates are a small fraction of the public dose limit, no discernable health effects are anticipated due to exposure to radioactive releases from Project activities. Doses to workers will be monitored and managed as part of Canadian Nuclear Laboratories' Radiation Protection Program. The application of the Radiation Protection Program ensures that exposures will be kept as low as reasonably achievable and below the effective dose limit of 100 mSv over 5 years, and below 50 mSv in any single year.

The total radiation dose to human receptors during the post-closure phase (i.e., Normal Evolution Scenario) are below the Canadian Nuclear Safety Commission public dose limit of 1 mSv/a, as well as the dose constraint for the Project of 0.25 mSv/a (Figure 6). Since the dose estimates are a small fraction of the public dose limit, no discernable health effects are anticipated due to exposure of potential critical groups to radioactive releases from the Whiteshell Laboratories site during post-closure.

The doses to human receptors that could be exposed to the non-radiological contaminants of potential concern (i.e., cadmium and lead) in surface water during post-closure were calculated based on total concentration (background plus Project contribution). The hazard quotients derived for contaminants of potential concern were below the protective benchmark for all receptors and pathways, other than the river drinking water pathway. If only the Project contribution is considered, the hazard quotients are well below the protective benchmark, indicating the Project contribution to the risk is minimal. Although uncertainties in the assessment exist, conservatism, such as using the highest release rates, has been included in the modelling so that residual effects are not greater than predicted.

A number of disruptive events were assessed to address uncertainties that arose during the definition of scenarios and conceptual models, with three bounding scenarios (disruptive events with the potential for greatest consequence) identified These were:

- Inadvertent Human Intrusion: an exploration borehole drilled into the Whiteshell Reactor Disposal Facility and exposure of wastes;
- Substantial Failure of In Situ Disposal Structure (Whiteshell Reactor Disposal Facility Barrier Failure); and
- Well in Plume: an on-site resident drinking groundwater from a well capturing the plume of releases from the Whiteshell Reactor Disposal Facility.

For all bounding scenarios the total radiation dose to human receptors during the post-closure phase are below the International Atomic Energy Agency Upper Reference Level for Disruptive Events of 20 mSv/a. For exposure to non-radiological contaminants of potential concern (i.e., cadmium and lead) the HQ exceeded the target values for some scenarios; however, the assessment was conservatively conducted to predict exposures to human receptors under these future unlikely conditions. Further, controls can be put in place to reduce the probability of the Disruptive Events (e.g., land use restrictions during post-institutional control period to reduce the likelihood of a human intrusion event).

For the fractured geo-pathway and the modified well in plume scenarios, the total radiation dose to all human receptors during post-closure is predicted to be well below the regulatory public dose limit of 1 mSv/yr, with the exception of the 3-month-old in the modified well in plume scenario. The HQs for all receptors in the fractured geo-pathway are well below the acceptable risk level of 0.2; therefore, no discernable health effects are anticipated. For the modified well in plume scenario, risk could not be ruled out for the on-site farm residents drinking groundwater in the plume of WRDF. However, the assessment was conservatively conducted to predict exposures to the on-site farmer under these unlikely conditions.

A key concern of Indigenous Nations was effects to the health of harvesters from consuming fish, plants, and wildlife in the vicinity of the Whiteshell Laboratories site. The approaches to exposure and toxicity assessment have ensured that the characterization of dose and risk has been undertaken in a manner that has not underestimated dose or risk. Overall, residual effects from radiological and non-radiological contaminants of potential concern are considered to be not significant for all human health valued components, including harvesters, during the closure and post-closure phases.

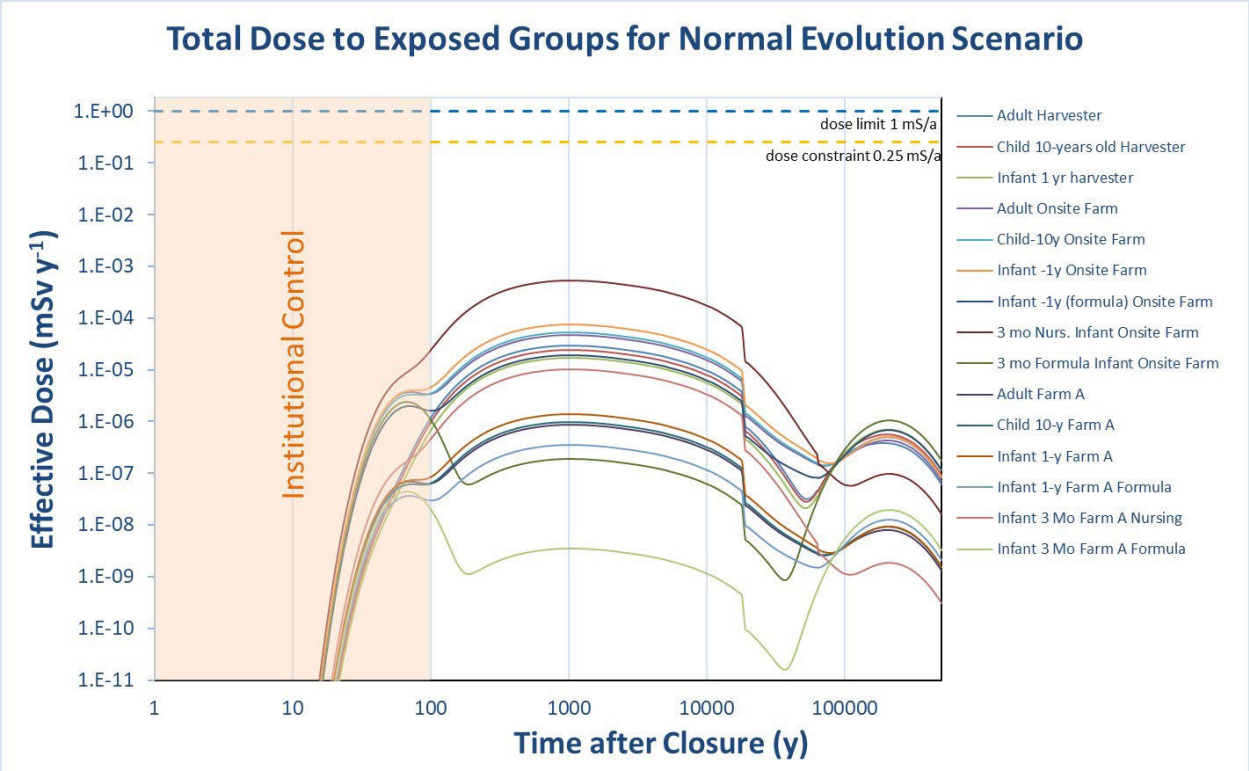


Figure 6: Dose Rate to Human Receptors from Normal Evolution Scenarios

Ecological Health Assessment

The Project has the potential to cause health effects to non-human biota (plants and animals) from Project activities. It is generally an impractical task to assess the effect of radiological and non-radiological emissions on all the species of biota within a natural ecosystem. Therefore, representative organisms are chosen for dose and risk analysis. These organisms are selected because they are known to exist on the site, and are representative of major taxonomic groups or exposure pathways, or have a special importance or value. Canadian

Nuclear Laboratories also verified the list of important species identified by each Indigenous community to confirm that each was adequately represented by the selected representative organisms. Based on feedback from Indigenous peoples during engagement activities, moose was added as a valued component to the ecological health assessment given the species importance to Indigenous people. Measurement endpoints for the ecological health assessment include changes in air quality, groundwater quality, surface water and sediment quality, soil quality and vegetation quality.

An environmental transport and pathways model was used to evaluate the effects of contaminants on ecological receptors. During closure, the assessment focuses on land animals and birds because releases are only expected via atmospheric pathways. After decommissioning (i.e., post-closure phase), the focus is on the aquatic animals, because releases area expected to be via groundwater to surface water pathways. Results of the radiological dose assessment for the closure and post-closure phases indicate that doses to ecological health valued components are below their respective benchmark values. In addition, there are no exceedances of the HQs identified for exposure of the ecological receptors to cadmium, lead, HB-40 (with the exception of benthic invertebrates in groundwater) and xylene. Therefore, no significant adverse effects on either aquatic or terrestrial populations or communities as a result of these chemical releases are predicted.

Benthic invertebrates were modelled assuming the organisms spend their entire lives in the peak discharge zone, and that no dilution of the groundwater occurs in the shallow sediment layers. This is conservative because a diffusion gradient will exist across the sediment-water interface, resulting in some degree of dilution into the top layer of sediment where most benthic organisms reside. Moreover, the seepage area represents a small part of the benthic community habitat, and the maximum groundwater concentration assumed represents the worst-case period. As such, a realistic benthic invertebrate population is not likely to be at risk due to cadmium, lead and HB-40 exposure, and any adverse effects will be spatially and temporally limited, such that the community as a whole is not expected to be significantly affected.

Most of the disruptive events modelled do not have an effects pathway to impact the ecological environment. For the one that does, the Whiteshell Reactor Disposal Facility Barrier Failure Disruptive Event, all predicted radiological and non-radiological doses are well below their respective protective benchmark values indicating that no adverse residual effects are expected. Therefore, it is unlikely that there would be significant adverse effects on either aquatic or terrestrial populations or communities as a result of radionuclide and non-radionuclide releases under a barrier failure scenario.

For the fractured geo-pathway sensitivity scenario, there are no predicted exceedances of the 9.6 mGy/d radiation dose benchmark for aquatic biota or of the 2.4 mGy/d radiation dose benchmark for terrestrial and riparian biota during Project post-closure. Therefore, it is unlikely that there would be potential adverse effects on terrestrial or aquatic populations or communities as a result of radionuclide releases from the Project for this sensitivity analysis. All HQs are below 1 indicating no adverse ecological effect is anticipated.

A key concern of Indigenous peoples was long-term effects of the Project on fish, plants and wildlife important to Indigenous peoples. The approaches to exposure and toxicity assessment have ensured that the characterization of dose and risk has been undertaken in a manner that has not underestimated dose or risk. Overall, residual effects from radiological and non-radiological contaminants of potential concern are considered to be not significant for all ecological valued components during the closure and post-closure phases.

Land and Resource Use Assessment

Traditional Land and Resource Use

The assessment of traditional land and resource use considers hunting, trapping, and gathering by Indigenous Peoples, archaeological and cultural sites, and the overall importance of the Winnipeg River. The traditional land and resource use assessment considered the potential for the Project to affect traditional land use through effects to vegetation, fish and wildlife and their habitats, and surface water quality in the Winnipeg River. Changes to the valued components could result from a change in the abundance and distribution of resources, the quality of the resource and the ability to access the resource including fish, wildlife and vegetation. The valued components selected for traditional land and resource use are cultural and archaeological sites, traditional land and resource use by Indigenous peoples, and the Winnipeg River.

The measurement indicators for each traditional land and resource use valued component include:

Cultural and Archaeological Sites: value, quantity, and quality of cultural and archaeological sites.

Traditional Land and Resource Use by Indigenous Peoples: relative abundance and distribution of fish, vegetation, and wildlife species; changes to vegetation, fish and wildlife habitat; relative abundance and distribution of vegetation and fish and wildlife habitat; changes to opportunities for traditional land use; and perceived and observed changes to the area's suitability for land use and/or quality of harvested resources.

Winnipeg River: changes to ambient levels of surface water parameters; relative abundance and distribution of fish and aquatic plant species; changes to aquatic vegetation and fish habitat; relative abundance and distribution of aquatic plant and fish habitat; expanded opportunities for traditional use; and perceived and observed qualities of water, aquatic plant species, fish, and aquatic habitat by traditional users.

The Project is located on Treaty 3 land, while the overall Whiteshell Laboratories site that extends west of the Winnipeg River falls on Treaty 1 land. Communities that form part of Treaties 1, 3 and 5 have historical and current land use ties with the area. Anishinaabe and Ojibway communities with historical traditional territories that have expressed interest in the Project include the Sagkeeng and Brokenhead First Nations in Treaty 1; Black River and Hollow Water First Nations in Treaty 5; and Shoal Lake No. 40, Iskatewizaagegan No. 39 Independent First Nation (Shoal Lake No. 39 First Nation), Northwest Angle No. 33 and Wabaseemoong Independent Nations in Treaty 3.

The Project is also located in the homeland of the Red River Métis. The Red River Métis community members live in the region around the Whiteshell Laboratories site and may use the lands nearby for traditional activities.

The tangible history of the Winnipeg River is documented by physical artifacts and features that are distributed over the landscape. Although there are currently no archaeological sites located on the Whiteshell Laboratories site, there is a site located approximately 1,700 metres south of the Whiteshell Laboratories site and the Winnipeg River has been an important travel route throughout history. In addition, three important sites can be found approximately 3,500 metres south at the confluence of the Whitemouth and Winnipeg rivers.

The Whiteshell Laboratories site has been operational since the 1960s, with public access generally restricted for safety and security reasons. Exceptions to this restriction include parcels of the Whiteshell Laboratories site on the west side of the Winnipeg River. No traditional land and resource uses are permitted on the Whiteshell Laboratories site; however, traditional land and resource use activities have persisted adjacent to the site, including uses of the Winnipeg River. It is expected that all activities and land use adjacent to the site will be able to continue in the future as the Project will have no effect on land usage beyond the Whiteshell Laboratories site boundaries.

The Project could affect traditional land use through effects to vegetation, fish and wildlife and their habitats, and surface water quality in the Winnipeg River. Changes to these valued components could result from a change in the abundance and distribution of resources, the quality of the resource, and the ability to access resources including fish, wildlife and vegetation. Any of these changes could subsequently affect the ability and the desire to engage in activities in the area of the Whiteshell Laboratories site. Threshold exceedances in harvested receptors through atmospheric releases and waterborne dispersion of contaminants are not anticipated. In addition, the mitigation proposed to minimize Project effects on surface water quality, the aquatic environment, the terrestrial environment, human health and ecological health are anticipated to eliminate or mitigate any potential adverse effects to the resources on which traditional land and resource use are dependent.

In collaboration with the First Nations and the Red River Métis and the public, Canadian Nuclear Laboratories is committed to meaningful and ongoing engagement on the Whiteshell Laboratories site remediation and clean-up activities. Although a small proportion of the Whiteshell Laboratories site will have restrictions on use because of the Project, it is still anticipated that the majority of the site will be safe and appropriate for unrestricted use. Overall, decommissioning of the Whiteshell Laboratories site will result in an increase in the land available for future use in the local study area. Future uses/zoning have not been determined, but the end-state plan for the Whiteshell Laboratories site is to return lands disturbed by site activities to a condition that is physically stable, safe and in keeping with the post-closure land use classification and release criteria. Consequently, the Project is expected to have a negligible effect on traditional land and resource use valued components.

Canadian Nuclear Laboratories is aware that each Indigenous Nation continues to have concerns about the potential effects of the Project and more broadly the Whiteshell Laboratories site on traditional land and resource use. As such, Canadian Nuclear Laboratories is committed to involving the First Nations and the Manitoba Métis Federation, and its citizens, in monitoring and to engaging with them over the long-term to address on-going concerns. Canadian Nuclear Laboratories will implement a Whiteshell Reactor 1 Environmental Assessment Follow-up and Monitoring Program to verify the accuracy of environmental effects and determine the effectiveness of mitigation that has or is to be implemented. In addition, to mitigate perceptions related to the suitability for use of the Whiteshell Laboratories site and the lands around it, Canadian Nuclear Laboratories will support robust communication of environmental monitoring results to confirm the safety of the Whiteshell Laboratories site and help address concerns about future uses.

Other Land and Resource Use

The assessment of other land and resource use includes consideration of non-Indigenous commercial, municipal, and federal land and resource use activities in proximity to the Project. These activities include agriculture, forestry, mineral claims and leases, water use, and outdoor recreation and tourism, sport fishing, outfitting, hunting, trapping, and other winter activities. The other land and resource use valued components chosen for the Project are land tenure, outdoor recreation and tourism, and the Winnipeg River.

The measurement indicators for each other land and resource use valued component include:

Land Tenure: availability of portions of Whiteshell Laboratories site for alternative future uses; and ability to maintain current land uses/tenures in proximity to the Project.

Outdoor Recreation and Tourism: relative abundance and distribution of fish and wildlife species; changes to fish and wildlife habitat; relative abundance and distribution of vegetation and fish and wildlife habitat; continued opportunity for recreational land use; and perceived suitability of area for outdoor recreation and tourism activities.

Winnipeg River: changes to ambient levels of surface water parameters; relative abundance and distribution of fish species; changes to fish habitat; and relative abundance and distribution of fish habitat.

The Whiteshell Laboratories site has restricted public access. Exceptions to this restriction include parcels of the Whiteshell Laboratories site on the west side of the Winnipeg River that have been continuously used for agricultural purposes under agreements with Atomic Energy of Canada Limited. No outdoor recreation and tourism activities are permitted on the Whiteshell Laboratories site. Land and resource use activities have persisted adjacent to the site, including uses of the Winnipeg River. Land use in the region includes forestry, recreation and tourism, hunting, trapping and fishing and limited agriculture. The Whiteshell Laboratories site is located 7 kilometres northwest of the Whiteshell Provincial Park and 49 kilometres southwest of the Nopiming Provincial Park, both of which are prime outdoor recreation areas in eastern Manitoba. Home and cottage development along the west side of the Winnipeg River suggests that waterways, scenery, trails and wildlife of the region are attracting vacationers and weekend campers. Sport fishing is very popular in the Winnipeg River. Agricultural operations in the region include cereals, hay, flax, canola and alfalfa crops, plus dairy and livestock production.

The Project could affect outdoor recreation and tourism activities through effects to vegetation, fish and wildlife and their habitats, and surface water quality in the Winnipeg River. Changes to these valued components could result from a change in the abundance and distribution of resources, the quality of the resource, and the ability to access resources including fish, wildlife and vegetation. Any of these changes could subsequently affect the ability and the desire to engage in activities in the area. There are not anticipated to be any threshold exceedances in harvested receptors through atmospheric releases and waterborne dispersion of contaminants. In addition, the mitigation proposed to minimize Project effects on surface water quality, the aquatic environment, the terrestrial environment, human health and ecological health are anticipated to eliminate or mitigate any potential adverse effects to the resources on which recreation and tourism activities are dependent.

It is expected that all activities and land use adjacent to the Whiteshell Laboratories site will be able to continue in the future as the Project will have no effect on land tenure or usage beyond the Whiteshell Laboratories site boundaries. Overall, with mitigation and engagement in place, Project effects on other land and resource use are expected to be negligible.

Socio-economic Assessment

Socio-economics refers to the way social and economic factors influence one another in local communities and households. The socio-economic environment assessment considers potential effects of the Project on the people and communities who are part of the existing socio-economic environment in the immediate vicinity of the Project. The socio-economic valued components chosen for the assessment are employment and income, business opportunities, government finances, community infrastructure and services, community well-being and public safety. The measurement indicators for each socio-economic valued component include:

Employment and Income: changes to local employment and income opportunities based on the change in decommissioning strategy for the Project and the ability to create future employment opportunities by attracting new businesses to the Whiteshell Laboratories site.

Business Opportunity: incremental expenditures for procurement requirements created by the Project and implications to the existing industry and business profile in the local and regional study areas.

Government Finances: the continued financial viability of the communities and rural municipalities in proximity to the Project.

Community Infrastructure and Services: traffic volumes and road infrastructure will be considered in relation to employee traffic and waste hauling; and potential change in the municipal revenue stream because of changes in the grant-in-lieu could alter the level of services offered in the Local Government District of Pinawa.

Community Well-being: continued socio-economic sustainability and overall well-being of communities in proximity to the Project, with a particular focus on the Local Government District of Pinawa due to the community's historical ties with the Whiteshell Laboratories site.

Public Safety: public safety for the Project is related to potential hazards associated with decommissioning activities including waste hauling and public access to the site during institutional control.

Canadian Nuclear Laboratories has been an important employer for residents of municipalities in the local area. Canadian Nuclear Laboratories employees reside primarily in Pinawa, Beausejour, Lac du Bonnet and Winnipeg. Canadian Nuclear Laboratories has typically provided high-paying jobs for highly trained employees. The Project is one part of the overall Whiteshell Laboratories Restoration Project.

With in situ disposal, there will be a reduced amount of radioactive waste transported off-site, and thus a reduced amount of traffic generated. The reduction in traffic will limit the potential for transportation incidents and risks to public safety. Considering the small number of additional employees required by the Project and the reduced amount of waste transported off-site, changes to traffic volumes associated with Project employment will have a negligible effect on the transportation infrastructure in the local area and reduce the probability that the public may be exposed to radioactive material.

The permanent presence of the Whiteshell Reactor Disposal Facility will change the suitability of the Whiteshell Laboratories site for future uses due to the restrictive land use categories that will be applied to the Whiteshell Laboratories site. Although a small proportion of the Whiteshell Laboratories site will have restrictions on use because of the Project (i.e., 0.07 hectares), it is still anticipated that the majority of the site will be safe and appropriate for unrestricted use, and that future designations will seek to maximize the amount of lands available for other uses.

The availability of land for future uses does not stem directly from environmental effects of the Project, but rather from the indirect effect of zoning restrictions that will be required for the Whiteshell Laboratories site into the distant future. The public expressed concern with the Project because it would limit the types of businesses and industries that could use the Whiteshell Laboratories site for future operations and therefore reduce the number of economic development opportunities available to them. Canadian Nuclear Laboratories provides support for the Community Regeneration Partnership, which has been established to create a feasible socio-economic plan for the region, facilitate economic development and hopefully provide high quality employment to replace the losses associated with the overall Whiteshell Laboratories site closure. Depending on the future uses and access to the Whiteshell Laboratories site, the plan is expected to help focus recruitment efforts or provide another route for achieving the same economic goals without reliance on the Whiteshell Laboratories site.

The implications of the decommissioning activities associated with Whiteshell Reactor 1 specifically, does not necessarily alter the number of new employment and/or contracting opportunities for the overall Whiteshell Laboratories Restoration Project, but rather indirectly changes the nature of the employment and/or contracting opportunities available and timeframe. The proposed change will increase the requirements for engineering and construction, while decreasing the amount of transportation labour required. While the schedule for reducing

employment has been accelerated, the Community Regeneration Partnership is working to enhance benefits for area communities and the Indigenous Nations in the local area to the extent possible.

Considering Canadian Nuclear Laboratories' programming to support current employees in transitioning to new work, Canadian Nuclear Laboratories' support of fostering economic development in the region, and the potential for siting a small modular reactor on the Whiteshell Laboratories site, the Project's indirect effects on employment and income, and business opportunities are expected to be negligible relative to the overall closure of the site despite the accelerated timeline and change in land use restrictions.

While the Project does not return the Whiteshell Laboratories site to an area completely available for unrestricted use, no residual adverse effects were identified between the Project and the aquatic environment or the terrestrial environment. Similarly, the ecological and human health risk assessment concluded it is unlikely that there would be significant adverse effects on either aquatic or terrestrial populations or communities as a result of maximum potential contaminant releases associated with the Project. Even under an accidents and malfunctions scenario (i.e., a Whiteshell Reactor Disposal Facility Barrier Failure Disruptive Event), all predicted radiological and non-radiological doses are well below their respective protective benchmark values indicating that no adverse residual effects are expected. With negligible effects predicted to the biophysical environments, the assessment does not indicate the potential for direct or indirect effects to the well-being of communities.

The Manitoba Métis Federation and the First Nations have commented on the ongoing adverse effects the presence of the Whiteshell Laboratories site has had on their well-being since the site's establishment in the 1960s, including ongoing fear and trauma for Sagkeeng First Nation members. The Red River Métis, Black River First Nation, Hollow Water First Nation, and Brokenhead Ojibway Nation have also noted that Whiteshell Laboratories site, along with other historical industrial development in the local area, have affected the communities' well-being by adversely affecting the environment. The change in the decommissioning strategy for Whiteshell Reactor 1 is understood from an Indigenous perspective as having the potential to result in fear, stigma and anxiety associated with the long-term presence of nuclear materials in the region.

Given the importance of the topic to Indigenous Nations, Canadian Nuclear Laboratories acknowledges that efforts to support dialogue and learning are central to the relationship going forward. As the Whiteshell Laboratories site is undergoing decommissioning over the next several years, Canadian Nuclear Laboratories will work with Indigenous Nations so that relationships endure, grow and adapt to future activities. As such, Canadian Nuclear Laboratories is currently working on establishing contribution/relationship agreements with each engaged Indigenous Nation, which include liaison positions and create mechanisms to develop and implement initiatives that will help address each Nation's unique interests and concerns related to the Project and the Whiteshell Laboratories Restoration Project.

The assessment does not indicate the potential for effects to the well-being of the First Nations and the Red River Métis since the effects documented by local Indigenous Nations are linked to the historical presence of the Whiteshell Laboratories site and there are no predicted changes to the biophysical environment. Canadian Nuclear Laboratories acknowledges that efforts to support dialogue and learning are central to the relationship going forward and both Canadian Nuclear Laboratories and Atomic Energy of Canada Limited are committed to working with each First Nation and the Manitoba Métis Federation going forward to develop programs and initiatives that provide meaningful mitigation to each Indigenous Nation to address the issues of fear and stigma identified.

Accidents and Malfunctions

This section of the Environmental Impact Statement focuses on accidents and malfunctions that could occur during the closure phase of the Project. Hazards and accidents and malfunctions which result in consequences only over long timeframes (i.e., Post-closure Phase) are not included in the accident and malfunction assessment, as they are assessed in the Decommissioning Safety Assessment Report and encompassed by the bounding scenarios for the human health risk assessment.

To identify potential accident and malfunction events during the closure phase, as well as their potential health and environmental effects that may occur, the Project used a systematic and comprehensive approach. Credible events were identified through a review of Project activities to identify hazards, which were assigned a likelihood and consequence severity ranking, and an overall risk priority level. The process of estimating the consequence severity index includes a consideration of existing Canadian Nuclear Laboratories programs, procedures and policies that are in place to mitigate potential hazards. The bounding or key potential accidents and malfunctions during the closure phase include:

- conventional occupational accidents including working at heights, working in confined spaces, working with energized systems, hoisting and rigging and falling objects;
- spills and leaks of hazardous substances including hydraulic fluid or fuel leaks from vehicles or heavy equipment, or failure of storage equipment;
- material handling accidents, such as a dropped load during movement of materials or equipment within the facility, which could result in the potential spread of contamination;
- off-site transportation accidents;
- equipment failure and malfunctions resulting from improper operation or maintenance, loss of services, or extreme environmental conditions;
- fires and explosions within the Whiteshell Reactor Disposal Facility; and
- aircraft crash at the Whiteshell Reactor Disposal Facility during closure.

Conventional occupational hazards are anticipated to be typical of a major construction project and evaluated to be controlled by human performance; thus, Canadian Nuclear Laboratories has put in place provisions including training, procedures and oversight of contractors to achieve as-low-as-reasonably possible accident and malfunction rates. Events such as spills and leaks, off-site transportation accidents, system and equipment failure, fire and explosions are well understood and encompassed by existing and proven engineering controls, management program and standard operating procedures at the Whiteshell Laboratories site. The residual risks for these accidents and malfunctions are expected to be within regulatory requirements. In addition, no off-site

effects are predicted for the accident and malfunction scenarios, including those identified by the public and Indigenous Nations.

Management systems and safety culture already in effect at the Whiteshell Laboratories site, where regular assessment of safety performance is conducted and lessons learned from experience are applied, will continue to be applied during the Project. Therefore, if an accident or malfunction situation occurs, Canadian Nuclear Laboratories has procedures in place that address requirements for immediate response and post-event clean-up or remediation.

Effects of the Environment on the Project

The assessment focused on the effects of natural hazards (e.g., extreme weather events, forest fires, seismic events) and climate change on the Project. It summarized the risks associated with each type of environmental change, along with environmental design features, management practices and other mitigation to reduce the risks.

Implementation of Canadian Nuclear Laboratories' Emergency Preparedness Program and the Fire Protection Program will mitigate the consequences of a forest fire and other extreme events (e.g., storms, extreme rainfall and snow) during the closure phase. During the post-closure phase, the concrete cap and engineered cover will be designed to limit water infiltration, and to direct water away from the Whiteshell Reactor Disposal Facility towards the Winnipeg River. The end-state plan for the Whiteshell Laboratories site, which includes the Whiteshell Reactor Disposal Facility, will be to return lands disturbed by site activities to a condition that is physically stable, safe, and in keeping with the post-closure land use classification and release criteria for the Whiteshell Laboratories. The surface drainage system for the reclaimed Whiteshell Laboratories site will have the physical characteristics similar to natural drainage systems in the general geographic region in terms of dynamic stability, robustness and longevity.

The Province of Manitoba is the least earthquake-prone area in Canada. Furthermore, the Canadian Nuclear Fuel Waste Management Program studied seismic stability in Northwest Ontario and Eastern Manitoba and found, based on a detection level of 2.5 on the Richter scale that the Whiteshell Laboratories site and the southern two-thirds of Manitoba are aseismic. Liquefaction is not seen as an issue for the Whiteshell Laboratories site due to the essentially aseismic conditions of Eastern Manitoba, and the consolidated nature of the overburden geology. The probability of earthquake damage from such low ground acceleration approaches zero in this area.

Climate change may result in shifts in the frequency and/or intensity of the extreme weather events, temperature precipitation and forest fires. When evaluating the potential effects from climate change, Project design features and mitigation as well as management and monitoring practices are also considered. The climate change resilience assessment completed for the Project indicates that the Project design is resilient to changes in climate. However, although the Project design is resilient, ongoing monitoring will be implemented as part of an adaptive management plan to monitor the performance of the infrastructure under the changing climate.

Monitoring and Follow-up Programs

Canadian Nuclear Laboratories will implement an Environmental Assessment Follow-up and Monitoring Program for the Project that will be integrated with the existing Environmental Assessment Follow-up and Monitoring Program for the Whiteshell Laboratories site (being implemented under Licence No. NRTEDL-W5-8.00/2024). The purpose of the Environmental Assessment Follow-up and Monitoring Program for the Project is to verify the accuracy of environmental effects and determine the effectiveness of mitigation measures that have been

implemented. The Environmental Assessment Follow-up and Monitoring Program for the Project will include sufficient information on the type, quantity and quality of information required to reliably verify effects predicted by the environmental assessment and confirm the effectiveness of mitigations. Wherever possible, existing programs (Effluent Monitoring Verification Program, the Groundwater Monitoring Program, and the Environmental Monitoring Program) will be adapted to meet the objectives of monitoring the predictions made in the environmental assessment for the Project.

A post-closure monitoring program will be developed as part of the Environmental Assessment Follow-up and Monitoring Program for the Project that will provide the sampling and analysis objectives and procedures for sampling and testing in the vicinity of the Whiteshell Reactor Disposal Facility during the institutional control period. Data generated by the monitoring program will be evaluated on an ongoing basis within an adaptive management framework. If the Environmental Assessment Follow-up and Monitoring Program for the Project identifies that environmental effects are greater than predicted, then Canadian Nuclear Laboratories will evaluate whether they result in changes to the conclusions in this Environmental Impact Statement that describes the Project and assesses the likely effects of the Project on the environment. If changes are confirmed, then Canadian Nuclear Laboratories will evaluate the need for revised mitigation actions and management practices to manage effects. Where the need for revised mitigation is identified, it will be developed and implemented. Conversely, cessation of a monitoring activity might be appropriate once it has been shown that an effect has stabilized, or has been reduced to a level where it is no longer considered significant with respect to regulatory requirements or community concerns. Any proposals on modifications to the monitoring program will be communicated to the Canadian Nuclear Safety Commission.

In addition to incorporating the monitoring actions of this Environmental Impact Statement into the Environmental Assessment Follow-up and Monitoring Program for the Project, Canadian Nuclear Laboratories is committed to reviewing and adapting the existing Environmental Assessment Follow-up and Monitoring Program for the Whiteshell Laboratories site to incorporate Traditional Knowledge that has been collected through the environmental assessment for the Project, as well as ongoing engagement and relationship building, in order to provide each community with the information that is relevant and important to them.

Canadian Nuclear Laboratories is committed to achieving continual improvement in environmental performance through its management systems. Canadian Nuclear Laboratories manages environmental-related matters through an existing Environmental Protection Program that includes compliance and improvement systems to evaluate areas for improvement or trending. The Environmental Protection Program will continue to be implemented during the Project's closure and post-closure phases, and will be updated, as needed, as part of an annual management review process.

Recognizing that the First Nations and the Red River Métis are stewards of the land who have a great interest in participating in monitoring at Whiteshell Laboratories site, Canadian Nuclear Laboratories has committed to engaging with each Nation on their specific interest and concerns regarding monitoring for the Project and the existing Whiteshell Laboratories Site Environmental Assessment Follow-up and Monitoring Program. Some of the key elements of the initiative may include expansion and evolution of the monitoring program at Whiteshell Laboratories, through incorporation of feedback, recommendations, Traditional Knowledge, capacity development, including training in environmental monitoring, and opportunities for monitors from each First Nation and the Red River Métis to collect samples on site and in the surrounding area. The goal of the initiative is to help address concerns regarding protection of the environment, health of people, confidence in the health of country foods and to reduce fear and stigma associated with the Project. It is also an opportunity to involve youth and Elders, collaborate on ecological restoration, and address Nation-specific interests and concerns related to

monitoring at the site. Each First Nation and the Red River Métis may have different preferences for how to participate in the initiative and Canadian Nuclear Laboratories commits to development of a program that is flexible to the needs of each Nation.

Canadian Nuclear Laboratories currently provides updates on environmental monitoring activities to all First Nations and the Red River Métis and invites them to observe and participate in the monitoring activities. Further, Canadian Nuclear Laboratories shares all the results of their annual environmental monitoring reports with all the communities and is in the process of developing a user-friendly document to share with Indigenous Nations. Canadian Nuclear Laboratories will continually evaluate both the process and the outcome of the ongoing engagement and communication activities, to address and manage issues as they arise.

Conclusions

This Environmental Impact Statement describes the Project and assesses the likely effects of the Project on the environment. The Environmental Impact Statement also includes an assessment of likely cumulative effects of the Project in combination with other previous, existing or reasonably foreseeable developments, as required. It describes the effects for normal conditions and as a result of accidents and malfunctions. The Environmental Impact Statement also describes and assesses the likely effects of the environment on the Project.

Throughout the environmental assessment process, Canadian Nuclear Laboratories has solicited input from the public and Indigenous Nations and incorporated this feedback into the Environmental Impact Statement where appropriate. Further, Canadian Nuclear Laboratories is working to develop long-term relationship agreements with Indigenous Nations to work collaboratively to meet the needs of the individual communities in the context of the Project as well as the broader operations of the Whiteshell Laboratories site into the future.

Canadian Nuclear Laboratories has concluded that in situ disposal is the best approach to permanently dispose of Whiteshell Reactor 1 based on detailed site and facility characterization studies and understanding of the technologies available to decommission small research reactors and dispose of the waste in Canada. Canadian Nuclear Laboratories believes the resulting Whiteshell Reactor Disposal Facility can be built to meet all federal and provincial regulations.

In situ disposal is a safe, cost effective approach for Whiteshell Reactor 1. Decommissioning activities can begin immediately with regulatory approval. Rather than dismantling, packaging and transporting the structure, the below-grade reactor systems, building components and associated radiological and non-radiological hazards will be permanently disposed of in situ. The above-grade structures will be demolished and removed using traditional demolition methods. In situ disposal uses multiple barriers to isolate and contain the waste, providing time for the radioactive materials to decay to safe levels. A concrete cap and engineered cover will then be constructed over the grouted structure.

Residual adverse effects were identified for air quality, hydrogeology, surface water quality, human and ecological health and community well-being. Mitigation and environmental design features implemented for the Project are well-understood and include existing practices at the Whiteshell Laboratories site. Canadian Nuclear Laboratories will implement an Environmental Assessment Follow-up and Monitoring Program for Whiteshell Reactor 1 to verify the accuracy of environmental effects and determine the effectiveness of mitigation that has or is to be implemented. Based on the evaluation, no significant adverse effects on human health or the environment were identified as a result of the Project.

Overall, the Environmental Impact Statement confirms that the in situ disposal approach provides a permanent, passive decommissioning end state, and incorporates proven technologies and best industry practices, including documented international experience. In situ disposal is a safe technique, reducing the risk to workers compared to dismantling and provides long-term safety to the public and the environment. Canadian Nuclear Laboratories wants to reassure the Public, the Red River Métis and First Nations that safety is a core value at Canadian Nuclear Laboratories and Canadian Nuclear Laboratories will continue to involve public and each Indigenous Nation every step of the way. The Project design has been optimized to remain below the assessment criteria established to be protective of the environment and to demonstrate long-term safety of the workers, the public and the environment. In addition, institutional controls, including restrictions on land use and a program for monitoring will be implemented to verify and validate these conclusions.