Initial Project Description

Deep Geological Repository (DGR) for Canada's Used Nuclear Fuel Project

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NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Nuclear Waste Management Organization

EXECUTIVE SUMMARY

Introduction

In 2002, the Government of Canada enacted the *Nuclear Fuel Waste Act* (NFWA) to establish a long-term approach for managing used nuclear fuel. The Act required the creation of the Nuclear Waste Management Organization (NWMO) to work with Canadians and Indigenous Peoples to recommend and implement a safe, long-term management plan.

Following a three-year national study with broad public input, the Government of Canada selected Adaptive Phased Management (APM) in 2007 as Canada's plan for the long-term management of used nuclear fuel. The approach includes the development of a Deep Geological Repository (DGR) to safely contain and isolate Canada's used nuclear fuel (hereafter referred to as "the Project").

After more than a decade of technical and community-based siting work, the Project site was selected in the Wabigoon Lake Ojibway Nation and Township of Ignace area of northwestern Ontario, approximately 21 km southeast of Wabigoon Lake Ojibway Nation and 43 km northwest of the Township of Ignace along Highway 17.

The Project is expected to span approximately 160 years, including site preparation, construction, operation (about 50 years), decommissioning and closure, and post-closure monitoring. The Project is subject to numerous laws, including the NFWA, *Impact Assessment Act* (IAA), and the *Nuclear Safety and Control Act* (NSCA). In addition, Wabigoon Lake Ojibway Nation is exercising its jurisdiction through its Regulatory Assessment and Approval Process. The Regulatory Assessment and Approvals Process is WLON's regulatory process grounded in Anishinaabe law, values, and responsibilities, and reflects WLON's authority to review and decide on development within its territory. The Canadian Nuclear Safety Commission (CNSC) will serve as the lifecycle regulator for all federally Licenced activities.

Why the Project is Needed

Canada's nuclear power plants have provided, and are expected to continue providing, clean, reliable, and low-carbon energy for decades. However, used nuclear fuel remains radioactive for a very long time and therefore requires careful, permanent management to avoid placing a burden on future generations.

A deep geological repository represents the internationally recognized best practice for the long-term management of used nuclear fuel. The Project provides a safe, permanent, and responsible solution that will ensure the used fuel is securely contained and isolated from people and the environment for generations to come.

Currently, used nuclear fuel is safely stored at reactor sites across Canada. While these interim measures are effective, they are not permanent and require active management. The Project will provide the long-term solution needed to protect people, communities, and the environment. This approach was endorsed by the Government of Canada when it selected APM inclusive of the Project in accordance with the NFWA and established oversight for its implementation.

The Project addresses an issue Canadians have consistently said should be resolved now rather than left for future generations. By safely containing and isolating used nuclear fuel, it also supports the continued role of nuclear energy as a reliable, low-carbon source of power and contributes directly to Canada's climate change commitments and goal of achieving net-zero emissions.

If implemented, the Project would:

- provide a permanent and safe disposal solution for used nuclear fuel

- support Canada's commitments to climate action and achieving net-zero by 2050 by ensuring nuclear energy remains a sustainable and socially responsible energy source
- eliminate the need for future generations to actively manage used nuclear fuel, thereby reducing long-term environmental risks and advancing intergenerational equity in managing Canada's nuclear legacy

Site Selection and Community Engagement

In November 2024, following a 14-year site selection process, extensive public engagement, and a comprehensive technical assessment demonstrating confidence in safety, the decision was made to locate the Project in the Wabigoon Lake Ojibway Nation and Ignace siting area. This milestone marked the completion of more than a decade of rigorous scientific study and a community-driven, consent-based siting process, advancing the Project into the regulatory decision-making phase.

Both Wabigoon Lake Ojibway Nation and the Township of Ignace have entered into Hosting Agreements with the NWMO for the life of the Project. These agreements reflect Canada's commitment to working with informed and willing host communities. While Wabigoon Lake Ojibway Nation's agreement remains confidential, the Township of Ignace's agreement is publicly available on the Township's webpage. Its objective is to enable the community to support and facilitate the Project by building capacity in areas such as infrastructure, economic growth, social and cultural development, and governance. The agreement also provides a framework for the Township to fulfill its roles and responsibilities within the regulatory process.

The site selection decision was based on two key pillars:

1. Confidence in safety – Over 10 years of scientific research, site characterization, and modelling have confirmed that the area's geology and environment are suitable to safely contain and isolate the waste.

2. Collaboration with communities – Site selection required the support of informed and willing hosts. Both Wabigoon Lake Ojibway Nation and the Township of Ignace confirmed their willingness through community-driven decision-making processes.

The Initial Project Description has been formally reviewed by Wabigoon Lake Ojibway Nation and the Township of Ignace, in keeping with their role as host communities for the Project.

Beyond the host communities, the NWMO continues to engage with:

- other potentially affected Indigenous groups
- local municipalities and councils
- the interested public, including residents, and land users with interests in the surrounding area, including those critical of the Project

The goals of this engagement are:

- to ensure that anyone who wants to learn about the Project has the opportunity to do so
- to ensure that those who may be potentially affected can participate in the regulatory process, so their knowledge, experiences, and perspectives contribute to meaningful assessments
- to work with Wabigoon Lake Ojibway Nation as they implement their Regulatory Assessment and Approval Process (RAAP); Wabigoon Lake Ojibway Nation is exercising its jurisdiction through its Regulatory Assessment and Approval Process; the Regulatory Assessment and Approvals Process is WLON's regulatory process grounded in Anishinaabe law, values, and responsibilities, and reflects WLON's authority to review and decide on development within its territory

Description of the Project

The Project will include:

- an underground repository, at a depth greater than 500 m below surface, where used fuel will be placed in engineered containers surrounded by a protective system involving clay and rock
- surface facilities for receiving, handling, and packaging the used fuel
- transportation activities along the primary and secondary access roads within the Project site
- supporting infrastructure, including access and haul roads, a rail spur, transmission line, a worker accommodation camp, and an excavated rock management area

The Project would contain and isolate approximately 5.9 million used fuel bundles, which is the projected total inventory of used nuclear fuel estimated to be produced in Canada from the current fleet of reactors to end of life, as outlined in the NWMO's 2024 Nuclear Fuel Waste Projections Report (NWMO, 2024). This projection is based on published refurbishment and life-extension plans for the Darlington and Bruce reactors, and the continued operation of Pickering A reactors (until end of 2024) and Pickering B reactors (until end of 2026), and on NWMO's assumptions used for planning purposes.

The Project is expected to last over 160 years, including site preparation, construction, operation, decommissioning and closure, and post-closure monitoring.

The Project does not include:

- transportation of used fuel from reactor sites to the Project beyond primary and secondary access roads at the Project site, as this is regulated separately under CNSC certification and uses existing transportation infrastructure
- NWMO's corporate offices or other off-site corporate infrastructure (e.g., Centre of Expertise)
- any capacity beyond 5.9 million bundles of fuel; increases in the proposed inventory would require approval from host communities and be approved by applicable regulators, including the CNSC as the lifecycle regulator for the Project

Regulatory Oversight

The Project is, and will remain, subject to the IAA, the NFWA, the NSCA and numerous other federal and provincial Licensing and regulatory requirements throughout its life. For example, a facility for the long-term management of radioactive waste, such as a DGR for used nuclear fuel, must meet the Licensing requirements of the *Class I Nuclear Facilities Regulations*.

In addition, under its Hosting Agreement, the NWMO has committed to honour the regulatory assessment and approvals process of Wabigoon Lake Ojibway Nation.

The NWMO's initial licence application to the CNSC will be submitted together with the Project's Impact Statement. This application will be prepared in general accordance with the guidance in REGDOC-1.2.3, *Licence Application Guide: Licence to Prepare Site for a Deep Geological Repository*. While the technical studies and assessments will address impacts and mitigation measures for the full life of the Project, the integrated submission will provide detailed information specific to the activities covered by the initial licence.

The scope of the initial licence application includes the following key activities:

- site clearing, grading, terracing
- development and operation of water management facilities for site preparation activities
- construction and operation of a worker accommodation camp

- development of non-nuclear supporting infrastructure (including utilities, fencing, administration building, worker accommodation camp, helipad, primary access road, and Excavated Rock Management Area [ERMA] and Organics Management Area [OMA])

Management of Other Radioactive Wastes

As part of the management of the used nuclear fuel, the Project will generate low-level radioactive waste (LLW) and intermediate-level radioactive waste (ILW) during operations, and decommissioning. These include things like contaminated protective clothing, tools, filters, or other materials used in operating the facility.

- Project generated-interim management: All LLW and ILW generated during the life of the DGR will be safely managed on site in Licenced facilities, consistent with the CNSC requirements.
- Long-term management: The eventual disposal of LLW and ILW will follow Canada's Integrated Strategy for Radioactive Waste, which directs that LLW be placed in near-surface disposal facilities and that ILW (and certain other wastes) be disposed of in another deep geological repository, which will undergo a consent-based siting process.

These requirements are set out in *Canada's Policy for Radioactive Waste and Decommissioning* and the principle that waste generators are responsible for the safe, long-term management of their wastes.

By following these policies, the NWMO ensures the Project aligns with both its mandate and Canadian policy for responsible radioactive waste management.

Safety and Environmental Protection

Protecting people and the environment is the foundation of this Project. The purpose of the Project is to ensure used nuclear fuel is safely managed over the long term so that it does not pose a risk to human health or the environment. The facility's design follows international best practices and meets Canada's rigorous regulatory standards.

The CNSC is the independent federal regulator responsible for overseeing all stages of the Project's lifecycle. The CNSC enforces the NSCA and its supporting regulations, which together ensure that all nuclear activities in Canada protect the environment, human health, and safety.

Under the NSCA, the purpose of regulation is to:

- limit, to a reasonable level, the risks to national security, health, safety, and the environment associated with the use of nuclear energy and substances, consistent with Canada's international obligations
- implement measures related to the international control of nuclear energy, including the non-proliferation of nuclear weapons and explosive devices

In regulating the Project, the CNSC applies the precautionary principle and a graded approach, meaning that the level of oversight and control is proportional to the potential risks associated with each activity.

As part of the regulatory process for the Project, the CNSC will participate with the Impact Assessment Agency of Canada and other federal authorities, such as Fisheries and Oceans Canada, Environment and Climate Change Canada, and Health Canada, to ensure a thorough assessment of potential environmental impacts is conducted under the IAA. The Impact Statement, including the technical studies supporting the initial licence for the Project, will evaluate potential changes to air, water, land, plants, and animals, and will identify measures to prevent or mitigate harm.

Under the NSCA, the NWMO will be required to demonstrate application of the As Low As Reasonably Achievable (ALARA) principle in assessing environmental components, to ensure

protection of people and the environment. The ALARA principle means that all reasonable efforts are made to minimize exposures and releases from the Project, taking into account social, technical, economic, practical, and public policy considerations. In other words, exposures and risks are kept as low as reasonably achievable, without compromising the intended purpose or disproportionately increasing other risks. The NWMO's impact assessment methodology for the Project is proposed to build on the assessments supporting the initial licence (including air, water, land, plants and animals) and to demonstrate application of the ALARA principle in evaluating whether changes to air, water, land, plants, and animals may result in significant or somewhat significant impacts to Indigenous Peoples.

Additionally, under the NSCA, the NWMO must, throughout the life of the Project, maintain and update its licensing basis, which will be the set of requirements and documents demonstrating how health, safety, security, and the environment will be protected. This includes the safety case, which encompasses site characterization data, pre- and post-closure safety assessment reports, and human health and ecological risk assessments. The licensing basis will evolve across phases of the Project to reflect proposed activities. At each licensing stage, the public and Indigenous communities will have the opportunity to participate, including through various means such as public hearings. Under the NSCA, the NWMO will be required to conduct its Project activities in accordance with the licensing basis.

The safety case extends beyond dose calculations of potential exposure to radiation due to the Project. It also draws on a broad suite of evidence and arguments, including:

- the scientific, technical, and managerial foundations supporting safety
- the suitability of the site and facility design
- insights from natural analogues
- assessments of radiation risks from the Project
- assurance of the adequacy and quality of all safety-related work

This safety case will serve as a primary basis for dialogue with regulators, Indigenous communities, and other interested parties.

If the NWMO is successful in obtaining impact assessment and initial licensing approvals, the Impact Assessment (IA) decision statement and the licence issued by the CNSC will include enforceable environmental protection requirements, such as:

- limits on radioactive and hazardous releases (e.g., water effluent and air emissions)
- obligations for environmental monitoring and emissions reporting
- emergency preparedness and response plans

The NWMO will also be required to implement an Environmental Protection Program that monitors performance, ensures compliance, and drives continuous improvement.

Initial Screening of Potential Impacts of the Project

Environmental Components

The NWMO has undertaken extensive site characterization and environmental baseline studies in accordance with the NSCA and the CNSC's REGDOC-1.2.1, *Guidance on Deep Geological Repository Site Characterization*. This work ensures that the information supporting the siting and design of the repository is comprehensive and reliable, forming a strong foundation for the federal impact assessment and the initial licence application.

The NWMO will continue to update site characterization and environmental monitoring data throughout all phases of the Project. This date will be used in future licence applications for construction, operation, decommissioning, and closure.

Drawing on more than a decade of geoscientific research, environmental data collection, and safety assessments, the NWMO has confidence in the safety and suitability of the selected site. The impact assessment and initial licence will assess components with the highest potential for measurable effects, informed by lessons learned from other major nuclear and environmental assessments, including projects undertaken by Ontario Power Generation (OPG) and Atomic Energy of Canada Limited (AECL).

Project activities that could result in environmental interactions include land clearing, blasting and excavation, water management, construction and operation of surface and underground facilities, materials handling, and in-site transportation. For the purposes of the Initial Project Description submission, the NWMO has applied a pathways-of-change screening approach to identify these interactions and to incorporate proven environmental protection measures drawn from comparable projects. Examples include:

- air quality and dust control: water spraying, material covers, and wheel-washing stations
- noise and vibration management: temporary barriers, controlled blasting, and limited work hours
- erosion and sediment control: silt fencing, sedimentation ponds, and progressive revegetation
- surface water protection: engineered drainage, water collection ponds, and treated effluent release
- wildlife and habitat protection: seasonal clearing restrictions and habitat restoration

With these measures in place, the likelihood of significant adverse environmental effects is expected to be low. This conclusion is supported by the NWMO's extensive site characterization work across key biophysical components, including climate, geology, geochemistry, groundwater and surface water, vegetation, wildlife, species at risk, and ambient radioactivity. The studies completed to date are sufficiently advanced to support the initial screening assessment of potential effects presented in Section E of the Initial Project Description. Overall, the results indicate that, once mitigation measures are applied, most environmental components present a low risk of adverse effects, reflecting the NWMO's commitment to the ALARA principle and the CNSC's rigorous regulatory oversight.

Land Use

The Project will result in some unavoidable changes to land and resource use, including:

- restrictions on access for safety and security reasons
- concurrent use of land and water where infrastructure is located
- how surrounding lands and waters are used due to perception

While these changes are anticipated, their extent, nature, and the appropriate mitigation measures will be further defined through the impact assessment and licensing processes.

As part of this work, the NWMO's engagement program will play a central role in deepening understanding of how people use and value the lands and waters in the area. Additional engagement with potentially affected Indigenous groups will help identify and characterize potential effects on Indigenous land use and potential impacts on Indigenous Rights. These perspectives will meaningfully inform the assessment of significance and the development of mitigation measures to ensure that Indigenous interests and Rights are appropriately considered and respected as part of implementation of the Project.

Social, Economic, and Cultural Components

Socio-economic reporting for APM, including the assessment of the effects of the NWMO's activities on a community's way of life and its social, cultural, and economic aspirations, is a mandatory requirement of the NFWA. The NWMO has reported on the effects of APM every three years since it

was selected in 2007 as Canada's plan under Section 18 of the Act and, as required by Section 12(6), previously submitted mitigation measures for social, economic, and cultural impacts for all phases of the Project on the federal government as part of *Choosing a Way Forward* (NWMO 2005).

Beginning in 2007 when APM was selected as Canada's Plan, the NWMO was authorized to begin work on the Project including community engagement for the purposes of site selection and developing and undertaking the siting process. These activities were understood to have both positive and negative outcomes, and the mitigation measures for the siting phase of APM outlined in *Choosing a Way Forward*, implemented and activities reported on.

The NWMO's current socio-economic baseline is presented in the Social, Cultural, Economic, and Health Baseline Studies Report. The Report is supported by extensive data collection and engagement with nearly 500 individuals and 70 organizations, as well as targeted community-specific studies such as the Ignace Area Community Well-Being Studies (2023). These studies examined how the Project aligns with the Ignace community vision, which is structured around four themes: people, community and culture, infrastructure, and economics and finance. The findings indicate that the Project could strengthen long-term economic stability, attract new residents and businesses, and improve local services and infrastructure through proactive planning.

Among the Project activities with the greatest potential to influence social and cultural conditions is the operation of the worker accommodation camp. The camp will be a dry facility and subject to security checks and access controls. Mitigation measures common to infrastructure projects with accommodation camps will be implemented to manage potential social effects. These measures include strict behavioural policies and enforcement, local hiring and workforce training programs, on-site recreational amenities, transportation management, and ongoing community liaison and monitoring.

In many cases, for the social, economic, and cultural components studied, additional work will be completed to support the impact assessment process, particularly the assessment for the Anishinaabe Peoples of Wabigoon Lake Ojibway Nation and other potentially affected Indigenous groups. However, the work completed to date in the NWMO's Social, Cultural, Economic, and Health Baseline Studies, Preliminary Report, which has been reviewed by the IAAC and Government Review Team, is considered sufficiently advanced to support the screening-level assessment of potential effects presented in Section E of the Initial Project Description.

This assessment demonstrates that many of these components are anticipated to have a low level of risk of adverse effects following the implementation of mitigation measures, as both the likelihood of occurrence and the degree of potential negative impact are expected to be small. This approach is consistent with the Impact Assessment Agency of Canada's *Operational Policy Statement* (IAAC 2022), which seeks to balance focused and relevant information requirements with the need to identify potential effects that may be material to decision making.

In the case of social, economic, and cultural components, the wealth of available baseline studies completed in the area suggests that many of the anticipated impacts are positive. The publicly available Ignace Hosting Agreement further outlines commitments that reinforce these positive outcomes through sustained investment in community well-being, infrastructure, and economic development.

While the current baseline primarily reflects non-Indigenous and municipal communities, the NWMO recognizes that Indigenous data are not yet represented. The NWMO will work collaboratively with potentially affected Indigenous groups through the impact assessment process to ensure that Indigenous social, cultural, economic, and health data are respectfully incorporated into the assessment. This work is expected to be grounded in respect for Indigenous data sovereignty, ensuring that Indigenous Knowledge and information are used in accordance with community protocols.

Initial Project Description Conclusions

The proposed Project was selected by the Government of Canada as Canada's plan for the safe, long-term management of used nuclear fuel. It offers a permanent solution for future generations, grounded in decades of scientific research, sustained community engagement, and alignment with international best practices.

Key messages

- **Site selection**—The site for the Project was selected in 2024 following more than a decade of study and the confirmed willingness of informed host communities. The draft Initial Project Description has been reviewed by Wabigoon Lake Ojibway Nation and the Township of Ignace, in keeping with their roles as host communities under their respective Hosting Agreements.
- **Scientific foundation and safety**—More than a decade of geoscience, environmental, and safety studies confirm the site's suitability and preliminary safety. These studies form the foundation for the CNSC's graded approach to risk and licensing. As the Project advances through site preparation, construction, operation, decommissioning, and closure, the NWMO will submit progressively more detailed safety, environmental, and design documentation to support licensing under the NSCA.
- **Socio-economic and cultural outcomes**—The Project is expected to generate lasting socio-economic and cultural benefits, particularly for municipalities and regional economies. Uncertainty remains regarding potential effects to Indigenous Peoples based on baseline data collection to date and therefore cannot be ruled out as carrying a non-negligible risk of significant effects. These potential impacts will be a central focus of the Impact Statement and addressed through assessment studies with Wabigoon Lake Ojibway Nation and ongoing engagement with potentially affected Indigenous groups. This work is expected to be grounded in respect for Indigenous data sovereignty, ensuring that Indigenous Knowledge and information are used in accordance with community protocols.
- **Safety and environmental protection outcomes**—With the application of industry-standard mitigation measures, the risk of significant or somewhat significant effects to components under federal jurisdiction (such as air, water, soils, plants, and animals) are expected to be low. Under the NSCA, the NWMO must demonstrate the application of the ALARA principle—ensuring that potential exposures and releases are kept as low as reasonably achievable, taking social and economic factors into account. Independent oversight by the CNSC will ensure that all mitigation and monitoring commitments are met.
- **Land and resource use**—The Project will result in some unavoidable changes to land and resource use, including access restrictions for safety and security, direct overprinting of land where infrastructure is located, and perceived concerns that may influence how surrounding lands and waters are used. These issues will be examined through Indigenous engagement, Indigenous Knowledge and land use studies, and harmonization with Wabigoon Lake Ojibway Nation's Regulatory Assessment and Approval Process.
- **WLON Regulatory Assessment and Approvals Process**—Wabigoon Lake Ojibway Nation is exercising its jurisdiction through its Regulatory Assessment and Approvals Process. The Regulatory Assessment and Approvals Process is WLON's regulatory process grounded in Anishinaabe law, values, and responsibilities, and reflects WLON's authority to review and decide on development within its territory.
- **Waste management alignment**—Management of low- and intermediate-level wastes generated by the Project will align with Canada's Integrated Strategy for Radioactive Waste, so that all radioactive materials are managed safely, responsibly, and in accordance with national policy.

- **Lifecycle oversight**—The CNSC will act as the lifecycle regulator, providing independent oversight and issuing authorizations only when the Project is demonstrated to be safe for people and the environment. The Project will also remain subject to other federal, provincial, and Wabigoon Lake Ojibway Nation approvals and will be under CNSC licensing for approximately 160 years, ensuring comprehensive oversight across its entire lifecycle.

The Project represents a responsible step toward ensuring the health, safety, and sustainability of Canada's environment and communities for generations to come. It is responsible because it provides a safe and permanent solution to Canada's used fuel waste, an issue Canadians have been clear should be addressed now, rather than left for future generations. The Project is also a critical component of Canada's nuclear fuel cycle, providing the permanent solution required to address the final stage of managing used fuel responsibly. By securing long-term management of used fuel, it supports the continued role of nuclear energy as a reliable, low-carbon power source and contributes directly to Canada's commitments on climate change and achieving net-zero emissions.