



NUCLEAR WASTE MANAGEMENT ORGANIZATION SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

# Phase 1 Preliminary Assessments

## SUMMARY FINDINGS AND DECISIONS



- Creighton, Saskatchewan
- Ear Falls, Ontario
- English River First Nation, Saskatchewan
- Hornepayne, Ontario
- Ignace, Ontario
- Pinehouse, Saskatchewan
- Schreiber, Ontario
- Wawa, Ontario

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## Purpose of Document

Over the course of a three-year nationwide dialogue, Canadians laid out a plan for the long-term management of Canada's used nuclear fuel. This plan, called Adaptive Phased Management (APM), includes a technical method and a management system. An important component of this plan is that Canada's long-term used fuel management facilities be sited in a safe location in a community that is informed and willing.

With this direction, in May 2010 the Nuclear Waste Management Organization (NWMO) launched a site selection process to identify a safe location in an informed and willing host community. The principles and decision-making framework for selecting a site were developed through a two-year collaboration and dialogue in 2008 and 2009.

The site selection process is continuing to advance through a multi-year series of steps to ensure that, above all, the site selected is safe, secure and meets the highest scientific, professional and ethical standards. Since launching the process, the NWMO has worked collaboratively with interested communities to begin to explore their potential to meet site selection requirements for locating the deep geological repository and Centre of Expertise, the core components of Canada's plan.

The objective of the site selection process, through several phases of progressively more detailed assessment, is to arrive at a single location for a deep geological repository and Centre of Expertise. It will take several more years of detailed technical, scientific and social study and assessments, and much more engagement with interested communities, their neighbours and Aboriginal peoples before a preferred safe site for the project can be confirmed.

With 21 communities exploring potential interest and suitability for hosting the project, the siting process must provide a basis to progressively narrow the focus to communities with strong potential to meet requirements until a single preferred site and area is identified. These decisions will be supported by a sequence of assessments and engagement designed to enable the NWMO and communities to learn more about the potential suitability of each area and decide whether to proceed to the next stage.

***The process of narrowing down the communities engaged in site selection commenced in Fall 2013 and will continue gradually over several years as more technical and social assessments are completed.***

The first phase of Preliminary Assessment was initiated upon request in 20 communities involved in the site selection process. It represents the initial phase of study in Step 3 of the nine-step site selection process, described in "Moving Forward Together: Process for Selecting a Site for Canada's Deep Geological Repository for Used Nuclear Fuel, May 2010." These assessments are intended to identify those communities with strong potential to meet specific technical, scientific and community well-being requirements for the project, recognizing much more study is required before site suitability can be confirmed.

Phase 1 Preliminary Assessments have now been concluded for eight communities. Assessments for another 12 communities are in progress.

This document reviews the outcome of assessments for the first eight communities:

- Ear Falls, Hornepayne, Ignace, Schreiber and Wawa in Ontario; and
- Creighton, English River First Nation and the Northern Village of Pinehouse in Saskatchewan.

This document also identifies the smaller number of communities from this group of eight that will be the subject of further study. The communities identified as warranting more detailed studies and engagement demonstrate at this early stage strong potential to meet the scientific, technical and social requirements of APM, understanding that no decision will be made that compromises safety.

Learning from Phase 1 Preliminary Assessments for each of the eight communities is captured in *Phase 1 Preliminary Assessment Reports*, together with a series of supporting reports. These reports outline findings that emerged from:

- desktop studies that explored the potential to find a site that can safely and securely contain and isolate used nuclear fuel from people and the environment for the long time period required; and
- working with the community to explore the potential for the project to align with the community's longer-term vision and to sustain interest in learning about the project through subsequent phases of work to support informed decision-making.

At this early point in the process, it must be emphasized that many questions remain to be addressed in future studies. The NWMO will work together with each of the communities identified for further study to address these questions and more intensively explore the potential to meet safety requirements, for the project to align with the community's longer-term vision, and for sustained interest.

Although the focus of the first phase of study is on communities that initiated engagement in the APM site selection process, it is understood that a broader partnership involving surrounding communities and Aboriginal peoples will be needed for the project to proceed. Through work so far with communities involved in the site selection process and initial outreach with surrounding communities and Aboriginal peoples, the nature and shape of the partnerships required to implement APM is beginning to emerge. Looking forward, this project will only proceed with involvement of the interested community, surrounding communities and potentially affected Aboriginal peoples working in partnership to implement the project.

## About Adaptive Phased Management

### A Matter of Safety and Responsibility

For decades Canadians have been using electricity generated by nuclear power reactors in Ontario, Quebec and New Brunswick. Just over 2 million used fuel bundles have been produced. When used nuclear fuel is removed from a reactor, it is considered a waste product, is radioactive and requires careful management. Although its radioactivity decreases with time, chemical toxicity persists, and the used fuel will remain a potential health risk to people and the environment for many hundreds of thousands of years. Canada's used nuclear fuel is now safely stored on an interim basis at licensed facilities located where it is produced. Putting in place a plan for the long-term, safe and secure management of used nuclear fuel for the protection of people and the environment is an important responsibility that Canadians share. Through dialogues with citizens and Aboriginal peoples across Canada, the NWMO has heard that this generation wants to move forward in dealing with our used nuclear fuel, believing it to be imprudent and unfair to future generations to wait any longer.

*The NWMO wishes to acknowledge the leadership of the 20 communities participating in Preliminary Assessments, and their contribution to the implementation of Canada's plan for the long-term management of used nuclear fuel.*

### The Foundation of Canada's Plan

The Government of Canada selected Canada's plan for the long-term management of used nuclear fuel in 2007. The plan, called Adaptive Phased Management (APM), involves the development of a large national infrastructure project in an informed and willing host community. The project involves the long-term containment and isolation of used nuclear fuel from people and the environment in a deep geological repository in a suitable rock formation. It also involves the development of a Centre of Expertise and a used fuel transportation system.

As required by the *Nuclear Fuel Waste Act* (2002), the NWMO is responsible for implementing Canada's Plan. The NWMO is committed to carrying out its work collaboratively with interested and affected citizens and organizations in a manner that is socially acceptable, technically sound, environmentally responsible and economically feasible.

## Adaptive Phased Management (APM) – At a Glance:

- Was developed through a nationwide dialogue between 2002 and 2005
- Was selected as Canada's plan by the Government of Canada in 2007, consistent with the Nuclear Fuel Waste Act
- Key features include:
  - Safe and secure centralized containment and isolation of used nuclear fuel in a repository deep underground in a suitable rock formation
  - A series of steps and clear decision points that can be adapted over time
  - An open, inclusive and fair siting process to identify an informed and willing host community
  - Opportunities for people and communities to be involved throughout the implementation process
  - Optional temporary shallow storage at the central site, if needed
  - Long-term stewardship through the continuous monitoring of used fuel
  - Ability to retrieve the used fuel over an extended period should there be a need to access the waste or take advantage of new technologies
  - Financial surety and long-term program funding to ensure the necessary money will be available for the long-term care of used nuclear fuel

## The Site Selection Process

Through a collaborative process in 2008 and 2009, the NWMO worked with interested Canadians to develop the decision-making framework for selecting a site for the project. The site selection process is laid out in the NWMO's document "*Moving Forward Together: Process for Selecting a Site for Canada's Deep Geological Repository for Used Nuclear Fuel, May 2010*" (NWMO, 2010).

The site selection process is designed to ensure safety, security and protection of people and the environment. Reflecting the guidance provided by Canadians, the site selection process is built on a set of principles that reflects the values and priorities of Canadians on this issue. The process also contains a number of steps these Canadians told us need to be part of the decision-making process to ensure it is an appropriate one for Canada. These steps are described in "*Moving Forward Together: Process for Selecting a Site for Canada's Deep Geological Repository for Used Nuclear Fuel, May 2010*."

Preliminary Assessments are conducted in Step 3 of the site selection process. Several additional steps must be completed over the course of the next several years before a preferred site will be identified and environmental assessment and regulatory review will be sought. Interested communities may leave the site selection process at any time during this process until a final agreement is signed, subject to all regulatory requirements being met and regulatory approvals received.

It is fundamental to the siting process that only an informed and willing community be selected to host the project as evidenced by a compelling demonstration of willingness involving community residents. The project will only be implemented in an area in which robust safety requirements can be met and well-being will be fostered.

## Communities Engaged

Figure 1 maps the locations of the 21 communities in Saskatchewan and Ontario that have been actively engaged in the site selection process (20 are in Step 3; one is in Step 2). These two provinces, along with Quebec and New Brunswick, are involved in the nuclear fuel cycle. Saskatchewan is involved through the mining of uranium, which is used in the fabrication of nuclear fuel. Ontario, Quebec and New Brunswick are involved through the production of electricity using nuclear power plants.



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**Figure 1: Communities in the Site Selection Process**

Communities presently involved entered the site selection process by expressing interest in learning more about Canada’s plan for the long-term management of used nuclear fuel and the APM Project (Step 2) as part of an open invitation process.

As communities expressed interest, the NWMO undertook an Initial Screening as part of Step 2 studies and began working with each community as they learned about the project and reflected upon their interest in it. The purpose of the Initial Screening was to determine whether, based on readily available information and five screening criteria, there were any obvious conditions that would exclude the community from further consideration in the site selection process.

For communities that successfully completed an Initial Screening and decided to enter Step 3 of the site selection process (Preliminary Assessments), the NWMO began working with the community to conduct a preliminary assessment. To date, 20 communities have requested Preliminary Assessments.

Communities initiated their assessments at different times. The first eight assessments, the subject of this report, were concluded in 2013. The NWMO expects to complete the next 12 assessments at a later date.

As of September 2012, after prior notification, the NWMO suspended the “expressions of interest” phase of the site selection process in order to focus efforts on working with the communities that had expressed interest to that point.

Decision-making about which of the initial eight communities should be the focus of more detailed studies began in Fall 2013, and will continue throughout the phases of progressively more detailed technical and social assessments.

- The NWMO has implemented an initial phase of narrowing down based on the results of Phase 1 Preliminary Assessments for an initial group of eight communities:
  - The Saskatchewan communities of Creighton, English River First Nation and Pinehouse.
  - The Ontario communities of Ear Falls, Hornepayne, Ignace, Schreiber and Wawa.

As identified in this document, a number of these communities with strong overall potential to meet site selection requirements are selected for further study and Phase 2 assessments. These Phase 2 assessments will begin in 2014.

- In 2014, the NWMO expects to complete Phase 1 Preliminary Assessments as requested for an additional 12 communities in Ontario: Arran-Elderslie, Blind River, Brockton, Elliot Lake, Huron-Kinloss, Manitouwadge, Nipigon, The North Shore, Saugeen Shores, South Bruce, Spanish and White River. As these assessments are completed, another phase of narrowing down will be implemented, with communities showing strong potential to be suitable identified for further study in Phase 2.
- Beginning in 2014, Phase 2 Preliminary Assessment studies will take place over a period of three to four years with a smaller number of communities that have strong potential to host the APM Project. Over this period, field studies will commence, community-focused engineering and design studies will be advanced, and engagement will be broadened. Building on earlier studies, Phase 2 will include:
  - preliminary geoscientific- and environment-focused field investigations;
  - preliminary safety assessments;
  - more detailed social, economic and cultural studies;

- awareness building and deepening learning and reflection by the interested community; and
  - broadening of engagement to involve surrounding communities and Aboriginal peoples in learning and assessment of the suitability of the area.
- By the end of the second phase of study, one or possibly two communities with strong potential to meet requirements to host the facility will be the focus of Step 4, Detailed Site Characterization. This step will include extensive studies to assess and confirm safety, and may require an additional three to five years or more to complete. Findings will support identification of the preferred location that will be the focus of a regulatory approvals process led by the Canadian Nuclear Safety Commission (CNSC).

## Two Phases of Preliminary Assessments

Preliminary Assessments address siting factors and criteria as described in the NWMO's document "*Moving Forward Together: Process for Selecting a Site for Canada's Deep Geological Repository for Used Nuclear Fuel, May 2010*" (NWMO, 2010). Preliminary Assessment studies in Step 3 of the siting process are being conducted in two phases, with the opportunity for stock-taking by both the community and the NWMO throughout.

- **Phase 1** – Assessments are conducted with all communities that successfully completed an Initial Screening and asked to be the focus of a Preliminary Assessment. This phase involves desktop studies to explore the potential to meet safety requirements, and includes studies of engineering, geoscientific suitability, environment and safety, and transportation. This phase also involves community-learning about the project, and engagement and reflection on the potential for the project to foster the well-being of the community and fit with its long-term vision. Working with communities, this phase also explores early indications as to whether it would be possible to sustain interest in learning through subsequent phases of work required to support informed decision-making and a compelling demonstration of willingness at a future stage. This phase begins to involve surrounding communities and Aboriginal people in a dialogue about the project that would continue in future phases. This phase of work is completed in a year or more.
- **Phase 2** – Assessments are conducted with a smaller number of interested communities selected by the NWMO based on the outcome of Phase 1 studies. Phase 2 work will further assess potentially suitable areas through detailed technical studies and field investigations. This phase also involves more detailed exploration of the potential to foster the well-being of the community. Learning and engagement are expanded to involve surrounding communities and Aboriginal peoples in exploring the potential to foster the well-being of the larger area, interest in the project, and the foundation to work together in partnership to implement the project. Together, the NWMO, potentially suitable communities, surrounding communities and Aboriginal peoples will reflect upon the suitability of the community and area to host the APM Project. Phase 2 Preliminary Assessments are expected to require approximately three to four years to complete.

This two-phased approach to assessments is discussed in “*Preliminary Assessment of Potential Suitability – Feasibility Studies*” (NWMO, 2011).

The focus of the preliminary assessments to date has been on Phase 1. Learning to date from Phase 1 Preliminary Assessment studies for eight communities is summarized in this document.

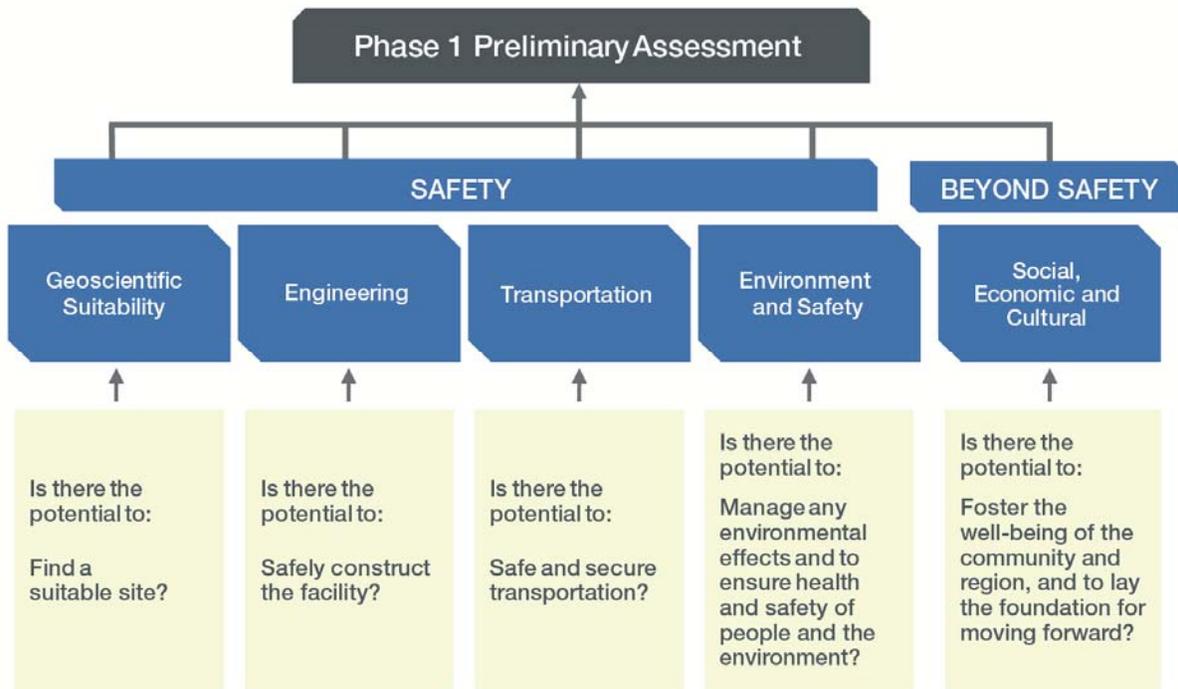
## **An Integrated Approach**

The NWMO has adopted an integrated approach to Preliminary Assessments. As outlined in “*Moving Forward Together: Process for Selecting a Site for Canada’s Deep Geological Repository for Used Nuclear Fuel, May 2010*” (NWMO, 2010), assessments focus on safety and community well-being, through study of many technical, scientific and social requirements for the project.

In assessing these siting factors and criteria, four overarching questions have guided this early phase of Preliminary Assessment, and have been a focus of reflection by both the NWMO and the community. These questions, which are discussed in “*Preliminary Assessment of Potential Suitability – Feasibility Studies*” (NWMO, 2011), will be studied further in expanded activities with communities progressing to Phase 2.

1. Safety, security and protection of people and the environment are central to the siting process. ***Is there potential to find a safe site?***
2. The project will be implemented in a way that will foster long-term well-being of the community. ***Is there potential to foster the well-being of the community through implementation of the project, and what might need to be put in place (e.g., infrastructure, resources, planning initiatives) to ensure this outcome?***
3. At a later step in the process, the community must demonstrate it is informed and willing to host the project. ***Is there potential for citizens in the community to continue to be interested in exploring this project through subsequent steps in the site selection process?***
4. The project will be implemented in a way that will foster the long-term well-being of the surrounding area. ***Is there potential to foster the well-being of the surrounding area and to establish the foundation to move forward with the project?***

These broad questions were addressed through a series of studies as outlined in the following figure.



**Figure 2: Structure of Phase 1 Preliminary Assessments**

In Phase 1, studies have involved a range of activities. Some activities have been completed by expert consultants, such as the assessment of the geological characteristics of the area, which is one of several studies focused on assessing the potential to find a safe site. Other activities were completed in partnership with the community; for instance, exploring the potential for the project to be implemented in a way that contributes to the long-term well-being of the community. Throughout, the NWMO has worked with community leaders to engage residents, and begin to reach out to surrounding communities, Aboriginal peoples and others in the area to involve them in the work. In Phase 2, these studies will be expanded through commencement of fieldwork and broadened engagement.

As discussed in the NWMO site selection process, the suitability of potential sites is assessed against a number of site evaluation factors, organized under six safety functions a site would need to satisfy to be considered suitable (NWMO, 2010). Phase 1 safety assessment studies initiated exploration of a subset of these factors using a desktop study approach. Phase 2 assessments will include field studies and borehole investigation, which will allow for a broadening of the assessment to more comprehensively address the evaluation factors. The six safety evaluation factors are:

- **Safe containment and isolation of used nuclear fuel:** Are the characteristics of the rock at the site appropriate to ensuring long-term containment and isolation of used nuclear fuel from humans, the environment and surface disturbances caused by human activities and natural events?

- **Long-term resilience to future geological processes and climate change:** Is the rock formation at the siting area geologically stable and likely to remain stable over the very long term in a manner that will ensure the repository will not be substantially affected by geological and climate change process such as earthquakes and glacial cycles?
- **Safe construction, operation and closure of the repository:** Are conditions at the site suitable for the safe construction, operation and closure of the repository?
- **Isolation of used fuel from future human activities:** Is human intrusion at the site unlikely, for instance, through future exploration or mining?
- **Amenable to site characterization and data interpretation activities:** Can the geologic conditions at the site be practically studied and described on dimensions that are important for demonstrating long-term safety?
- **Safe transportation:** Does the site have a route that exists or is amenable to being created that enables the safe and secure transportation of used fuel from storage sites to the repository site?

A number of factors beyond safety were identified for assessment of the potential for the project to foster the well-being of the interested community (NWMO, 2010). Phase 1 community well-being studies were focused on each community that expressed interest in learning about the project. For this reason, the studies addressed the subset of factors pertaining to the community. Phase 2 studies are designed to expand the assessment to consider factors related to the surrounding area, including surrounding communities and Aboriginal peoples. The factors beyond safety are:

- Potential social, economic and cultural effects during the implementation phase of the project, including factors identified by Aboriginal Traditional Knowledge.
- Potential for enhancement of the community's and the region's long-term sustainability through implementation of the project, including factors identified by Aboriginal Traditional Knowledge.
- Potential to avoid ecologically sensitive areas and locally significant features, including factors identified by Aboriginal Traditional Knowledge.
- Potential for physical and social infrastructure to adapt to changes resulting from the project.
- Potential to avoid or minimize effects of the transportation of used nuclear fuel from existing storage facilities to the repository site.

In order to ensure a broad, inclusive and holistic approach to assessment in these areas, a community well-being framework was identified to help understand and assess the potential effects of the APM Project. This framework was used to help explore the project, understand how communities and the surrounding area may be affected should the project be implemented in the area, and identify opportunities to leverage the project to achieve other objectives important to people in the area. In the future, broadened engagement may expand the framework through, for instance, insight from Indigenous science, ways of life and spiritual considerations.

## What We Learned – Findings for Eight Communities

Phase 1 Preliminary Assessments have concluded for the first eight communities that entered the site selection process. These include the Ontario communities of Ear Falls, Hornepayne, Ignace, Schreiber, and Wawa, and the Saskatchewan communities of Creighton, English River First Nation and Pinehouse.

Potential suitability was studied for each interested community, exploring the areas of safety and community well-being as described in the previous section. For each community, findings are presented in a series of assessment reports focusing on individual aspects of the studies and are summarized in a *Preliminary Assessment Report* that brings findings from individual studies together in a single document. Findings from these assessments are briefly summarized in the discussion that follows.

### 1. In all eight communities, studies found potential to meet project requirements in three safety-related areas.

At this early phase of assessment, studies have suggested that all eight communities have potential to meet safety-related requirements focused on engineering, transportation, and environment and safety.

- **Engineering – All eight communities have potential to meet requirements related to safe construction of the facility in the area**

Assessments completed to date concluded that from an engineering perspective, there is potential to safely construct the facility in each of the eight communities. There are differences among communities in terms of topography and supporting infrastructure, which will have implications for costs, construction and operation depending on where the project is implemented. At this early stage of assessment, all communities have potential to meet the engineering requirements of the project.

- **Transportation – All eight communities have potential to meet requirements related to safe and secure transportation to a site in the area**

From a technical perspective, there is potential to safely and securely transport used nuclear fuel from existing interim storage facility sites to each of the eight areas studied. Radiological safety is assured through the robust transportation package. Different distances would be involved in transporting used fuel to the eight communities studied. It is acknowledged that longer distances introduce potential for increased conventional traffic accidents and an increased carbon footprint. Transportation is an important element of the project that will become a focus of public engagement to understand important societal considerations. It is expected that groups and individuals will have questions, concerns and preferences to be addressed as assessments continue through the second phase of study and engagement. At this early stage of assessment, all communities have potential to meet the technical transportation requirements of the project. Social considerations will be assessed in the next phase of work.

- **Environment and Safety – All eight communities have potential to meet requirements related to managing any environmental effects and ensuring safety of people and the environment**

At this early stage, the environment and safety preliminary assessments identified some areas that would not be suitable for siting, but did not identify any obvious conditions that would preclude siting anywhere near the eight communities. For communities that will continue into Phase 2 of the preliminary assessment, the environmental characteristics of the candidate areas will be important in guiding the identification of more defined potentially suitable siting areas. Local community input and field studies will be required in Phase 2 to better understand and characterize the local environmental conditions. Working collaboratively with local Elders, the NWMO will also seek to understand Aboriginal Traditional Knowledge to further guide understanding of the area. Wherever the selected site is located, there will be environmental effects to be managed or mitigated. Many of these effects would be similar to other large industrial or mining projects. Potential effects would be managed or mitigated through a combination of site selection, in-design features, operating practices, and an environmental monitoring and management plan. At this early stage of assessment, all communities have potential to meet the environment and safety requirements of the project. Social considerations in this area will be more intensively examined in the next phase of work.

**2. Studies found some potential in all eight communities to address project requirements related to geoscientific suitability (a key safety requirement), and social, economic and cultural considerations. However, there are important differences among communities. These differences have influenced NWMO decision-making on where best to focus more detailed studies.**

At this early phase of assessment, studies have identified differences across communities in two important study areas.

The first involves the geoscientific characteristics of the communities and area, including geological settings and geologic structural histories, and associated complexities and uncertainties. Areas with greater geoscientific uncertainties and complexities are considered to have less potential to meet project requirements as it would be more difficult and challenging to assemble a robust safety case.

The second area involves differences in the potential for the APM Project to align with priorities and objectives of the community, and for the community to sustain interest in learning about the project. Sustained interest would be needed for a future demonstration of informed willingness. Alignment of the project in terms of fostering well-being and the potential for sustained interest are important considerations once all safety requirements are met. Where there is not a strong alignment with community aspirations or where this alignment is unclear, and where the ability to sustain interest is weak or uncertain, the NWMO considers the potential for informed willingness at a later stage of work to be lessened.

▪ **Geoscientific Suitability – Potential to find a site with suitable geology**

The geoscientific suitability of the communities was assessed in a consistent manner using a wide range of data sources, including geophysical surveys, geological maps, technical reports and papers, and government geoscientific databases. Geoscientific suitability is the first consideration in identifying communities and areas that warrant further study, as no decision will be made that compromises safety.

While all eight communities studied are located in crystalline rock of the Canadian Shield, they exhibit significant diversity in their geological settings. At this early stage of the site evaluation process, assessments showed that each community contains broad areas that have the potential to satisfy the geoscientific safety requirements for hosting a deep geological repository. However, the assessment identified varying degrees of geoscientific complexity and uncertainty between communities, reflecting their different geological settings and structural histories. The different geoscientific characteristics that would need to be better understood through more detailed studies and field investigations relate to:

- The geological characteristics relevant for assessing the containment and isolation function of the potential host rock, including rock type, lithological homogeneity, thickness and lateral extent.
- The potential influence of known and interpreted structures such as fractures, faults and dykes on the integrity of the host rocks and the ability to find siting areas with sufficient volumes of suitable rock.
- The potential impact of surface conditions within the candidate areas on site characterization and repository construction. These include the distribution and thickness of the overburden deposits (surficial soils), topography and surface water bodies.
- The potential for the repository to be disturbed by future human activities through exploration and exploitation of natural resources.

Uncertainties associated with the above factors specific to each community are documented in detail in the series of geoscientific assessment reports completed for each community.

▪ **Community Well-Being – Potential to foster well-being in the community through the implementation of the project**

The assessments suggest that each of the communities has the potential to benefit from the implementation of the APM Project. However, there are differences in the degree to which the project appears to align with longer-term aspirations and priorities of the community *taken as a whole*. In some cases, the project appears to align well with the most important objectives of a community, and in other cases, it aligns with only some, but not all the important objectives. In communities that fall into the second group, the project challenges the community to make difficult choices among these priorities and objectives. For this reason, there is a greater potential for divergence around the project and for a negative effect on community cohesion. In these circumstances, the NWMO judges the potential for the project to foster community well-being to be diminished.

All eight communities see potential to harness the APM Project to achieve important community goals. This is because, to a greater or lesser extent, all eight communities are interested in economic development to enhance their sustainability. In this regard, the project would contribute to the well-being of each of the communities.

Similar to other large projects, the APM Project would bring direct, indirect and induced jobs to a community and area. This would help a community retain population, grow population and develop economically. The increased population would be a boost to the community and a catalyst for spinoff growth and development. Skills and labour supply in the community would likely diversify and expand with the increased population and as a result of new and diverse job opportunities created by the project. An increased population will, in turn, help with goals related to education through expanding enrolment, which will help sustain existing schools and create the financial foundation for enhancing educational opportunities within the community. More households and greater expenditure would open up market opportunities for local businesses to service the expanding needs of a growing and more affluent population. From the perspective of community finances, the assessment base would be expected to grow and become more equitably spread across industry, residential and commercial components. Increased funding and participation would allow the community to upgrade and expand its health services, as well as recreational and social programs. The project would be expected to help provide a more stable population base for a community through retention of younger families and youth and by providing the ability to support its middle-aged and senior populations. The APM Project will be implemented over many decades, and would contribute to community sustainability over this extended period.

The population and economic activity that would come with the project has the potential to benefit communities seeking to build out existing community infrastructure, enhance services and expand population. It also has the potential to benefit those that would prefer the project to be located away from the community using a more remote site model, with the community providing key personnel, services and other support.

However, within some communities, there is ongoing debate and division about the amount and type of growth desired over the long term, and the project has the potential to reinforce these divisions. For instance, there is active debate in some communities about whether industry and economic diversification ought to be the priority they pursue to drive long-term sustainability or whether ecotourism ought to be their way of the future. The NWMO believes both of these objectives could be supported through implementation of the APM Project. However, if the project divides along the same lines as an ongoing and divisive conversation about the community's long-term vision, the potential to align the project with the vision will be diminished, and continuing discussion may negatively affect community cohesion.

A project of this scope and scale has the potential to be transformational to a community and area in many ways. Communities have helped the NWMO understand that the potential effect of the project on other aspects of community life need to be considered, such as: connection with the land and with other community members; ability to pursue activities such as hunting, fishing, gathering, and trapping, which may be of spiritual, cultural or personal importance; sense of responsibility for protection of the Earth, future generations, and respect for all Creation; and other aspects important to the way of life of a community. The extent to which the project has the potential to align with community well-being in these important areas is a matter for the community to reflect upon and decide. Where community reflection and discussion has suggested there is potential for

fundamental conflict between the project and these aspects of community well-being, or where alignment is uncertain, the NWMO judges that the potential to foster the overall well-being of the community is lessened.

- **Interest – Potential for sustained interest to support further learning**

The assessments suggest that each of the communities has at least some potential to sustain interest in the project to support learning over an extended period. However, the communities differ in the magnitude of the challenge involved in sustaining interest. In communities where there are large challenges to be addressed in order to sustain interest, the NWMO believes there is less potential for continued learning and ultimately informed willingness within the planning horizon of the project.

Over the course of the last 18 months or more, the NWMO has engaged with a wide variety of community leaders and residents, and learned about their reflections on the APM Project. Through these interactions, the NWMO has developed a preliminary understanding of the potential to sustain interest and learning in the community over the extended period of time required by more detailed studies. Communities differ in the magnitude of the challenge involved in sustaining interest, reflecting the unique social and political dynamics and interest in each of them. These may include pre-existing divisions within the community (related to, for example, community priorities), or negative experiences with other industries or initiatives that breed apprehension or mistrust in the APM Project. Where there are fundamental differences within a community about its future direction, the NWMO has observed less overall interest in learning about the project. As well, where division in the community about this project falls along the same lines as historical divisions or divisions on other long-standing matters, the NWMO has also observed low levels of interest in learning. For communities where these conditions apply, the NWMO sees diminished potential to sustain interest.

The site selection process encourages communities to learn about the project and reflect upon their interest at each phase of study, in progressively more detail as work proceeds. As part of the process of learning and dialogue to this point, community members have, naturally, expressed concerns and questions about the safety for people and the environment, as well as how the project may help the community achieve the future it has set out for itself. The expression of concerns, strong opinions and questions in an environment of mutual respect are considered by the NWMO to be signs of active learning by a community that is genuinely considering their interest in hosting the project. The NWMO considers the potential for sustained interest and learning to be high in communities for which these circumstances apply.

However, in a community where tension and fundamental concern has resulted in confrontation, antagonism, a high level of misinformation, and division, the potential for sustaining interest is diminished. In this situation, the NWMO believes that even if a higher level of effort were made to address misinformation and engage citizens, it would be highly uncertain as to whether this increased effort would lead to improvement in understanding or interest in the project. The NWMO judges the potential for sustained interest to be less in communities for which these circumstances apply.

- **Well-Being and Interest of Surrounding Area – Potential to foster community well-being in the surrounding area, as well as sustain interest to support further learning**

The APM Project requires establishing a long-term partnership that first begins with the interested community, and only then seeks to extend out to involve surrounding communities and Aboriginal peoples. Engagement of surrounding communities and Aboriginal peoples is at a very early stage, and will be a focus of Phase 2 assessments for the smaller number of communities identified for more detailed study. Alignment of the project with the values, priorities and objectives of surrounding communities and Aboriginal peoples, together with their level of interest in learning, will ultimately be a critical consideration in assessing the suitability of any particular site. This project will only proceed with the involvement of the interested community, surrounding communities, and Aboriginal peoples working together to implement it.

In this early phase of assessment, the focus has been on supporting the interested community to reflect on its vision, whether the APM Project has the potential to align with this vision, and whether it wishes to explore the project further. While the community has been reflecting on whether it wishes to continue in the process or end its involvement, there has been limited outreach and engagement to surrounding communities and Aboriginal peoples. With this limited preliminary engagement as a guide, the NWMO has reflected on the potential to engage surrounding communities and Aboriginal peoples as the process continues. This has been a consideration in the selection of the smaller number of communities to be the focus of the next phase of work.

### **Managing Uncertainty**

Through Phase 1 studies, the NWMO has developed a preliminary understanding of the potential for communities to meet the requirements of the project. In conducting these early studies, questions have been raised and uncertainties identified. These questions and uncertainties vary across communities and add to the complexity of decision-making at this point. The NWMO has learned much from communities over the course of these studies and has reflected upon this learning.

Given the preliminary phase of work along with the questions and uncertainties still to be addressed in the future to enhance understanding of suitability, the NWMO recognizes the value of building diversity into the selection of communities and areas for future study. In light of the learning from Preliminary Assessment studies, the NWMO sees value in deliberately selecting areas with different geological settings, as well as different social, economic and cultural characteristics. This will ensure that the NWMO actively explores the potential to ensure safety through study of a variety of geological conditions. This will also make sure the potential to foster community well-being and to develop the kinds of partnerships that will be required with communities, surrounding communities and Aboriginal peoples can be investigated through the divergent interests and values of a range of communities.

The NWMO believes that building diversity into the selection of communities and areas for further study will allow for flexibility to readjust focus if further studies in a particular area yield unexpected developments. This flexibility will help ensure the ability to adapt the siting process in response to new learning from these studies. By ensuring a diversity of areas for future study and flexibility to respond to the learning that will emerge, the foundation for a future, robust siting decision can be further built upon.

## Partnership

Over the course of initial studies, the NWMO has learned a great deal from communities about working together to envision the project and how best to implement it in collaboration with those potentially affected.

The involvement of surrounding communities and Aboriginal peoples is critical to advancing the site selection process for several reasons. First, and as outlined in assessment reports, initial studies have demonstrated it is possible to find land areas in the communities studied that have the potential to satisfy required geoscientific factors and enable the project to be implemented in a way that is respectful of people and the natural environment. These potentially suitable areas include areas in the vicinity of the community on Crown land, and in territory for which Aboriginal peoples have a claim. As identified in *“Moving Forward Together: Process for Selecting a Site for Canada’s Deep Geological Repository for Used Nuclear Fuel,”* the NWMO has committed to respect Aboriginal rights and treaties in the siting decision, and take into account that there may be unresolved claims between Aboriginal peoples and the Crown. Furthermore, as outlined in the *“NWMO Aboriginal Policy,”* the NWMO acknowledges, respects and honours that Aboriginal peoples – Indian, Inuit and Métis peoples of Canada – have unique status and rights as recognized and affirmed in s.35 of the *Constitution Act, 1982*. The NWMO is committed to respecting the Aboriginal rights and treaties of Aboriginal peoples.

As well, the size and scale of APM is such that its implementation will not only have an effect on the local area in which it is sited, it will also have an effect on those in the surrounding area. Surrounding communities and Aboriginal peoples need to be involved in decision-making about the project and planning for its implementation if it were to proceed in the area. Only through working together can the project be harnessed to maximize benefits to the area, manage any negative effects that may result, and ensure it fosters long-term well-being and sustainability in a way that is consistent with the area’s vision for the future. Throughout the process, the unique status and rights of Aboriginal people must be respected.

## Communities With Strong Potential Suitability for the APM Project

When findings from the assessments for the first eight communities were taken into account, the following four communities demonstrated strong overall potential to meet the requirements for the APM Project and will be the focus of more detailed studies to further explore suitability for the project:

- Creighton, Saskatchewan
- Hornepayne, Ontario
- Ignace, Ontario
- Schreiber, Ontario

The focus of Phase 2 studies will continue with this smaller number of interested communities where the potential to meet the wide range of project requirements is strong, and the process of dialogue and learning can be sustained.

For each of these four communities, the overarching questions described earlier can be answered affirmatively. In summary, Preliminary Assessment studies conducted to date suggest there is potential for each of the four communities and areas to be suitable for the project from multiple perspectives.

1. There is potential to find a safe site in the area.
  - There is potential to find a site with suitable geology.
  - There is potential to safely construct the facility at the potential site.
  - There is potential for safe and secure transportation to the area.
  - There is potential to manage any environmental effects and to ensure safety of people and the environment.
2. There is potential to foster community well-being in each community through the implementation of the project.
3. There is potential for sustained interest in each community to support further learning about the project.
4. There is potential to foster community well-being in the surrounding area through the implementation of the project, and also to sustain interest in surrounding communities to support further learning.

For each of these four communities identified for further study:

- The APM Project has the potential to be safely located in a suitable site within or near the community in a manner that will protect people and the environment now and in the future.
- From a technical perspective, there is potential to safely transport used nuclear fuel from existing storage facility sites to any of these areas.

- There is potential to find a site that does not adversely affect future options for other activities valued by the community and area. In other words, if any of these areas were to be selected for the APM Project, it is likely that a geologically and environmentally suitable site can be found that does not jeopardize long-term objectives and future uses of the land and resources valued by the community as understood today.
- There is a strong potential for sustained interest in the local community. Each of the four communities appears to be largely cohesive and supportive of pursuing further learning about the project and the benefits it poses for the community. There is evidence to suggest strong potential for longer-term sustained interest in progressing through the NWMO siting process.
- Based on very preliminary engagement, there is potential for sustained interest in the surrounding area through continued activities to include nearby communities and potentially affected Aboriginal peoples in learning and discussion about the implications of the APM Project and suitability for the area. There is potential for regional cohesion and willingness to work together in further exploring the opportunities of the project.
- There appears to be strong potential for the APM Project to foster well-being in each area. If APM facilities were sited in or near any one of these four communities, the community and many communities in the area would experience significant economic development and growth. This development and growth has the potential to align well with their collective aspirations.

In summary, each of the selected four communities is understood to have potentially suitable areas that would meet specific technical siting requirements designed to ensure safety. In addition, each has a longer-term vision and aspirations that may align well with the APM Project. In each, there is potential for strong interest in sustaining involvement and exploring the project further, and there is potential to engage the surrounding area in the learning and decision-making process.

Full accounts of assessment findings are available in the community assessment reports.

### **The Platform for Further Study**

It is important to note that the four communities of Creighton, Hornepayne, Ignace and Schreiber were identified for further study in Phase 2, but have *not* been confirmed as suitable for hosting the APM Project. Also, no community has confirmed its willingness to host the project.

Regarding safety, several more years of field studies and detailed site evaluations are required before the NWMO, the community and the regulator could be satisfied on the safety of the site. In the interim, there is much more information to be gathered, data to be analyzed, questions to be answered, and uncertainties to be explored in collaboration with communities to better understand the potential of sites to meet requirements. Further research questions will be carried forward to Phase 2 to explore in greater depth the range of important geoscientific, environmental, transportation and engineering considerations key to assessing suitability and ensuring safety.

At this early phase of the process, communities are still learning and engaging in a dialogue within the community and with neighbours. More time and reflection will be required before they can arrive at informed decisions as to whether the APM Project would make a positive contribution to the long-term well-being of the area and that they are willing to host it.

The more detailed studies planned for Phase 2 will enable the NWMO and the communities to gain an expanded understanding of potential suitability. For example, geological field investigations will bring forward important additional site-specific information that will be used to assess residual geoscientific uncertainties identified during Phase 1 studies and gain more insight into geoscientific suitability of the communities. In considering community well-being, early dialogues in Phase 1 revealed important community-specific priorities, concerns and challenges that will be important to address in continuing phases of work. Other areas of uncertainty, and opportunities for detailed work, are expected to be identified as the NWMO and communities continue to work together and the process continues.

Examples of the range and type of uncertainties and areas for further study and dialogue are outlined below.

### **Geoscientific Considerations**

While the four communities appear to contain broad areas with potential to meet the NWMO's geoscientific site evaluation factors, the assessment identified characteristics specific to each area that require further assessment.

In the Creighton area:

- potential impact of the shear zones and mapped faults in the vicinity of identified potentially suitable broad areas.
- relatively small extent of the potentially suitable geological formations.
- the high mineral potential of the surrounding greenstone belt.

In the Hornepayne area:

- potential impact of the geological subprovince boundary that runs through the Hornepayne area.
- the low resolution of available geophysical data over most of the area.
- the presence of numerous dykes.
- degree of metamorphism and its potential impact on the homogeneity of the metasedimentary rocks in the area.

In the Ignace area:

- low resolution of available geophysical data over a large part of the area.
- the impact of overburden cover on the ability to conduct site characterization activities in some areas.

In the Schreiber area:

- potential impact of regional features, such as the Midcontinent Rift, the Gravel River fault and the Wawa-Quetico subprovince boundary.
- presence of numerous dykes.
- potential impact of rugged topography on constructability and the hydrogeological regime at depth.

Phase 2 activities will focus on evaluating these uncertainties and will provide additional information that can be used to assess and compare potential suitability of the communities. Aspects of this work will need to be aligned with community input, including the involvement of Aboriginal peoples. Importantly, input from the community, surrounding communities and Aboriginal peoples is required for the identification of potential sites for borehole drilling.

### **Environment and Safety**

Environment and safety studies to date suggest there is potential to implement the APM Project safely and with respect for the environment in each area. These studies suggest the project's effects on the environment can be managed or mitigated through a combination of site selection, in-design features, operating practices, and implementation of a sound environmental monitoring and management plan. Once specific potential siting areas have been identified in each community's area, these mitigating measures will need to be identified and their effectiveness confirmed.

Although the assessment has identified some specific areas that would be excluded because they contain parks and protected areas, a more definitive environmental evaluation will be required once specific potential siting areas have been identified. These studies could result in excluding additional areas based on such factors as the presence of migration routes, proximity to important habitats and cultural sensitivity. Discussions with local community groups and Aboriginal groups, as well as field studies, will be needed to fully characterize the environmental conditions in these smaller potential siting areas.

Looking to Phase 2, environment and safety evaluations need to be aligned with input from the community, surrounding communities and Aboriginal peoples. This requires engagement by the NWMO and capacity building to enable this input, which could include Aboriginal Traditional Knowledge. Input from communities on potential transportation routes, as a group with a shared interest, will also need to be incorporated.

Phase 2 activities will address these uncertainties and will provide additional information that can be used to assess and compare potential suitability of the communities.

### **Transportation**

Transportation studies conducted to date suggest there is technical potential to safely transport used nuclear fuel from interim management sites where it is currently stored, to each of the four communities. Transportation will involve travelling long distances from current interim storage sites to these communities. Further work is required to identify and develop potential transportation routes and mode(s) to each site that will meet detailed technical safety criteria.

Looking to Phase 2, transportation planning and evaluation needs to be aligned with community input, which requires:

- taking into account social values and preferences, and understanding and addressing social questions and concerns;
- understanding and addressing regulatory matters along the routes in several provinces including New Brunswick, Quebec, Ontario, Manitoba and Saskatchewan; and
- input from communities on transportation routes, as a group with a shared interest, about potential transportation routes.

Phase 2 activities will address these uncertainties and provide additional information to assess and compare potential suitability of the communities.

### **Community Well-Being, Interest and Potential for Willingness**

Preliminary Assessment studies conducted to date suggest there is potential to foster well-being, sustain interest, and engage surrounding communities and Aboriginal peoples in further assessing suitability for the APM Project. While all four communities appear to have strong potential to meet requirements in this area, more work is needed to explore and confirm this potential.

Key determinants of suitability include decisions people will make in the future about learning more about the project, potential to foster well-being of the community and area, and ultimately whether they are willing to host the project and support its implementation in the area. Based on Phase 1 studies, the NWMO cannot anticipate with certainty the outcome of a dialogue that would need to continue into the future in order to support informed decision-making. To fully understand the suitability of a community and area to host the project, engagement activities need to continue and broaden to involve surrounding communities and potentially affected Aboriginal peoples in the learning and decision-making process.

Across all the communities that continue to the second phase of study, the important questions that need to be explored and addressed include:

- Among potentially suitable land areas, can specific smaller siting areas be identified that are also socially acceptable?
  - In every community, there have been very preliminary discussions about how the community interacts with the land, and the types of activities community members engage in and where, which would need to be respected in the identification of possible specific sites for further study. For example, some community members in Schreiber have commented on the importance of protecting the Lake Superior National Marine Conservation Area and preserving the shoreline of Lake Superior for other uses when identifying possible sites for further study in their area. Each community can be expected to have its own priorities and preferences that will be important in guiding and focusing future study.
  - For each of Creighton, Hornepayne, Ignace, and Schreiber, discussion will need to expand beyond the community to include surrounding communities and Aboriginal peoples who will have their own perspectives. It will be important in this further work that Aboriginal Traditional Knowledge be integrated into the identification and assessment of potentially suitable sites. It is expected that the integration of Aboriginal Traditional Knowledge will bring with it an expanded set of criteria with which to assess the suitability of a site, new and different approaches to data collection and interpretation, and a perspective on ways of life which will be important to informing more detailed studies and ensuring a deeper appreciation of local cultural and spiritual connections to the land.

- Can an implementation plan for the project (including engineering, logistics and/or community well-being) be developed to ensure safety, align with expectations of the community and area, and be economically feasible?
  - The siting process encourages shared planning to ensure that, as much as possible, community needs and expectations are understood, and if possible, addressed in the design of implementation plans.
  - The NWMO and communities will need to develop a better and more detailed understanding of project benefits and how potential negative effects associated with project implementation can be managed in a specific area to better understand alignment of the project with community priorities, objectives and aspirations.
  - Phase 2 will explore the total resources required to support safe project implementation as the NWMO assesses whether the investment required to ensure this outcome is a reasonable and prudent use of ratepayer funds. This assessment will include looking at location-specific costs to design, construct, and operate the facility; costs of required transportation and other infrastructure upgrades; and costs of investments required to foster well-being in the community and area.
  
- Can interest and conversation in the community and area be sustained through subsequent phases of study, which will span several years and multiple election cycles?
  - The project demands a sustained interest and participation from the community in a process of learning over an extended period. The ability to sustain interest and participation will be better understood through intensive engagement activities during Phase 2 studies.
  
- Can the social and political conditions be supported for the advancement of the study in the broader area, including involvement of the community, surrounding communities and Aboriginal peoples working in partnership to implement the project?
  - Beyond sustained interest and participation, the APM Project ultimately requires those who will be affected to be able to work together to envision and help plan implementation in the area. Intensive engagement activities led with Creighton, Hornepayne, Ignace and Schreiber during Phase 2 studies will build understanding of the ability to form the kind of working partnerships that will be required for the project to proceed in their areas.

## The Way Forward

### Next Steps for Communities

More than three years after the launch of the siting process, the eight communities that were early entrants to the site selection process are at the end of their Phase 1 Preliminary Assessments, and decisions have been taken on the smaller number that will become the focus of the next phase of studies.

With the conclusion of Phase 1 studies for the first eight communities, four are identified as having strong potential suitability to meet siting requirements for the APM Project and warrant further study. The NWMO looks forward to discussing next steps with Creighton, Hornepayne, Ignace and Schreiber, and reviewing together the Phase 2 program.

The NWMO will work closely with the communities of Ear Falls, English River First Nation, Pinehouse and Wawa to conclude work in their communities.

The NWMO wishes to acknowledge the leadership role taken by each of these communities and their contribution to defining the path forward and advancing Canada's plan for the long-term management of used nuclear fuel.

The NWMO is continuing Phase 1 assessments underway with 12 other Ontario-based communities and expects to bring these to completion in 2014. The findings of those assessments will guide the next round of decision-making by identifying additional communities that may show strong potential to meet siting requirements and to be the subject of more detailed Phase 2 studies.

### A Continued Process of Taking Stock

Through a multi-year sequence of engagement and assessments, the NWMO and communities will continually take stock. This will help focus progressively more detailed studies in areas with strong potential to meet the requirements, and over time, arrive at a single, preferred, safe site in an informed, willing community.

The outcome of Phase 1 Preliminary Assessments guided early decisions about where to focus more detailed studies among a subset of the initial eight communities. A smaller number of communities with strong potential to meet the many siting requirements will be the focus of Phase 2 Assessments involving detailed field studies and broadened dialogue.

When findings emerge that suggest a community has low potential to meet project requirements, timely discussions will take place to support the orderly conclusion of studies in that area. Communities recognize that a process of narrowing down is a required and inevitable part of the siting process, and have asked to be updated regularly and kept apprised if studies suggest they are not strong candidates. Out of respect and fairness for the communities involved, the NWMO has committed to regular stock-taking with communities to review findings throughout the multi-year period of assessments. This narrowing down process will enable studies and resources to be concentrated in areas that hold greater potential to be suitable.

## **Moving Forward in Partnership**

Each community engaging in Preliminary Assessments has helped initiate the process of relationship building needed to support the implementation of the APM Project.

Through work with interested communities, and initial outreach to surrounding communities and Aboriginal peoples, the NWMO is learning about the nature and shape of partnerships that will be required to implement the APM Project together. Involving surrounding communities and Aboriginal peoples in learning and decision-making will be an important focus of Phase 2. Ultimately, the implementation of Canada's plan will only proceed with the involvement of the interested community, surrounding communities and potentially affected Aboriginal peoples working in partnership to implement the project.

As Canada continues along the path of implementing APM, it will take our collective best knowledge and expertise, the continued leadership of communities, and all of us working together to ensure the safe long-term management of Canada's used nuclear fuel.