MAY 2017

NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

PRELIMINARY ASSESSMENT OF POTENTIAL SUITABILITY

Initial Borehole Drilling in the Hornepayne and Manitouwadge Area

In 2010, the Nuclear Waste Management Organization (NWMO) began technical and social studies in and around a number of communities, including Hornepayne, Manitouwadge and White River, that expressed interest in assessing their suitability for safely hosting a deep geological repository for the long-term management of Canada's used nuclear fuel. These studies have become increasingly more detailed over time and focused on locations that have potential to safely host a repository.

Before selecting a potential repository site, the NWMO needs to be confident that a deep geological repository can be developed with a strong safety case at that location. A safety case brings together all the information that contributes toward understanding whether or not a repository at the site could safely contain and isolate used nuclear fuel. This information includes Indigenous Knowledge, geoscientific assessments, environmental surveys and monitoring, engineering design studies, and safety assessment analyses.

The focus of early geoscientific studies is to determine if there are rock formations in the area that have potential to satisfy the NWMO's safety requirements for a deep geological repository.

The next site evaluation activity in the area involves drilling an initial borehole in a potential repository location to further understand the geology. Depending on findings, additional borehole drilling and testing in one or more locations may be warranted in the future.

Drilling an initial borehole and associated testing will build upon findings of earlier studies. Selecting a location for an initial borehole provides an opportunity for the NWMO, the interested communities, and First Nation and Métis communities in the area to work together and to reflect upon where the project might best fit.

Beyond ensuring safety, the NWMO has committed to communities and the surrounding area that the project will be implemented in a way that fosters long-term well-being as defined by the community.

Key Steps

To date, the NWMO has completed a number of studies to explore potential suitability of the area to meet the robust technical safety requirements to host the project. The NWMO has shared these findings with communities in the area and published reports on its website.

- Desktop studies, using available information, identified broad areas that have the potential to host a deep geological repository (2013 to 2015). These areas were temporarily withdrawn from staking for mineral claims to provide an opportunity for initial field studies to proceed.

- Initial field studies, including airborne geophysical surveys and observing general geological features, identified candidate areas for further field studies, such as detailed geological mapping (2015).

- Detailed geological mapping completed in summer 2016, provide additional information to understand the suitability of geology in the area. These studies help identify smaller areas that have potential to meet technical safety requirements for a deep geological repository. These smaller areas could be the focus of more detailed study, beginning with drilling an initial borehole.

Selecting a Site for the Long-Term Management of Canada's Used Nuclear Fuel

Canada has a comprehensive plan for the safe, long-term management of the used nuclear fuel produced by its nuclear power plants. The plan includes a process to identify an informed and willing host for a deep geological repository that will contain and isolate the material.

Next steps involve the NWMO and people in the area working together to review findings from technical studies completed to date and plan next steps. Together, we will:

1. Review findings from detailed geological mapping and the smaller areas that have been identified as potentially suitable for hosting a deep geological repository;
2. Decide which of these smaller areas should be the focus of further study, beginning with initial borehole drilling at or near a potential repository site, and develop plans for these studies;
3. Seek permits and work authorizations for borehole drilling, as required;
4. Initiate borehole drilling and testing; and
5. Review study findings and decide on next steps.

Should the area proceed beyond these initial studies, the next phase of work would involve additional borehole drilling and testing focused on a preferred potential repository site in the area. We would decide together on a preferred location. Ultimately, any preferred site will need to have the potential to meet the project's robust safety requirements and be in a place where a strong partnership reflecting area support can be developed.

Example of core

What is borehole drilling?

A borehole is a narrow, deep, circular hole made in the ground using motorized equipment (drilling equipment). The process involves drilling the borehole and retrieving cylinder-shaped rock samples, called core. A wide range of testing is performed on samples of the core and in the borehole to investigate properties of the rock.

What is the purpose of this initial borehole drilling and testing?

Initial borehole drilling will provide more information about whether the geology in the area could be a safe place for a repository. Borehole drilling and testing will help further assess and understand key geological features and uncertainties identified in previous studies. It will provide information about the depth of geological formations, rock types, and the nature of fractures in the rocks.

Building a better understanding of the geology will help the NWMO as it works with people in the area being studied to identify potential repository sites.

Where will the initial borehole be drilled?

We need to decide on a possible location for an initial borehole together with people from the area, including the interested communities, and First Nation and Métis communities in the area. In addition to meeting technical objectives, the borehole drilling location will be selected to respect land use, and cultural and spiritual values of people in the area related to siting of the repository.

To get the discussion started, the NWMO will propose possible locations for initial borehole drilling based on findings from the detailed geological mapping. These locations will be in or near areas that may have potential as a repository site. The NWMO will review these potential drilling locations together with people in the area to determine where it should focus initial borehole drilling and testing activities.

The NWMO anticipates drilling one initial borehole. The location of the borehole will be informed by data from detailed geological mapping and the geoscientific information collected in previous studies.

How will the NWMO interweave Indigenous Knowledge into initial borehole drilling and testing?

The NWMO is committed to interweaving local Indigenous Knowledge in all phases of its work.

The NWMO will work together with Aboriginal peoples in the area to respectfully apply Indigenous Knowledge of the natural environment and traditional lands, and cultural and spiritual values they may wish to share to guide borehole drilling and testing.

The NWMO will ensure Aboriginal intellectual property is protected as agreed to with Aboriginal peoples who choose to share that knowledge.

Aboriginal peoples have a special relationship with the natural environment, and unique stewardship responsibilities that are part of this relationship. The knowledge that comes from this relationship with the land brings special understanding to the broad range of factors that should be considered in field studies, social assessments, and assessing benefits and effects to be managed.

What permits are required?

The NWMO will require permissions from the Ministry of Natural Resources and Forestry (MNRF). We will comply with MNRF conditions in order to use Crown lands for borehole drilling.

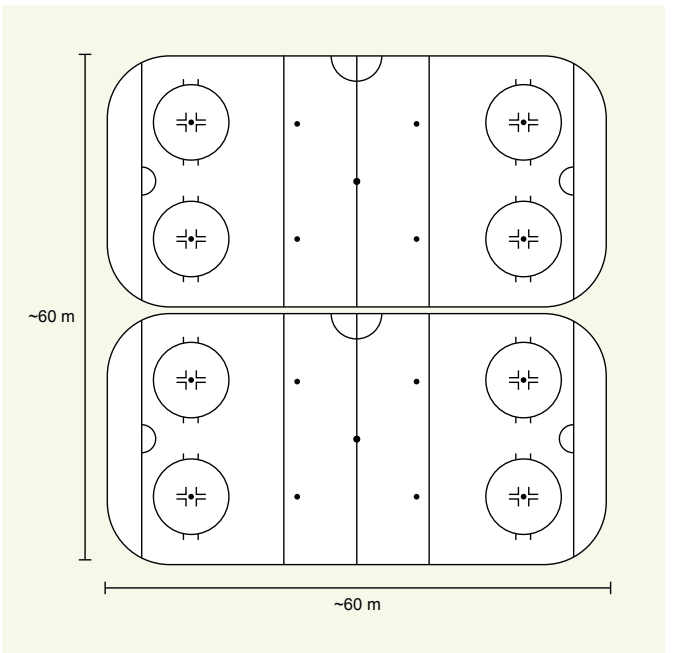
The NWMO will prepare submissions to MNRF with the involvement of people in the area. Once a request for permission is submitted, the process will involve the interested communities in the area, and consultation with affected First Nation and Métis communities.

When will the initial boreholes be drilled?

Scheduling for the first stage of borehole drilling and testing will depend on the time needed to identify preferred locations, collaborate with communities to develop work plans, and obtain work authorizations.

How much land is needed to drill a borehole?

The footprint required for a drill site is around 60 metres by 60 metres, or about the size of two NHL-sized hockey rinks side by side. The area may be fenced depending on its location.



Footprint required to drill a borehole

Rotary drilling

What equipment is used?

Boreholes are drilled using a conventional truck-mounted or track-mounted rotary drill rig. The drill site will likely need to be prepared and graded using granular materials, such as sand and gravel.

Trailers will be set up at the site for use as field offices, for on-site equipment storage, and for a small field lab for on-site testing and preserving rock core and water samples. Electricity for these facilities will be supplied by power generators.

Rock core will be stored in a core storage facility in a nearby community. Depending on the location of the borehole, rock core may be stored on a temporary basis at the drill site, and later, moved to the core storage facility.

Will drilling and testing cause any impact to the environment?

Drilling activities will be managed to minimize impact on the environment. During all stages of fieldwork, the natural environment will be protected.

A source of water and a drill water management system will be required. The NWMO may bring water to the site or source it from a nearby body of water.

Water will be recycled on-site during drilling to minimize

use and release to the environment. Drilling water and cuttings will be managed safely in accordance with provincial regulations. This may involve on-site management or transportation off-site.

During preparation of access routes and use of water, drilling fluids and solids will be managed in accordance with provincial regulations. The NWMO will work with communities in the area to confirm plans, including how it will minimize the impact of these drilling activities on the local environment.

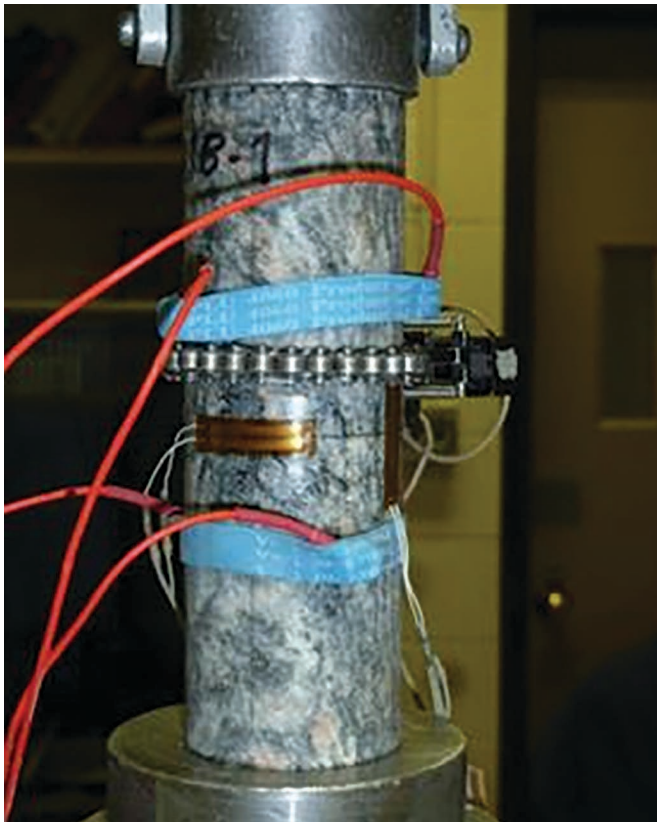
How deep will the boreholes be?

Boreholes will be drilled and cored to a depth of about one kilometre. It is anticipated that the deep geological repository in the type of geology found in the area (crystalline rock) would be developed at a depth of approximately 500 metres below ground surface. Deep boreholes are required to assess suitability of the host rock at depth.

What kind of testing is conducted?

Testing will be used to develop a more detailed understanding of the geological suitability of the rock in the area. Testing includes:

- Logging of the rock core, which involves a geologist inspecting the core to find out the main rock types present, as well as the location and direction of any natural breaks in the core (fractures or faults), and recording this information;
- Geomechanical measurements, which involve testing rock core samples taken from the borehole to provide information about rock strength;
- Geophysical measurements made along the length of the borehole to provide information on minerals, fractures and zones of groundwater flow present within the rock;
- Hydraulic conductivity measurements made at selected locations along the length of the borehole will provide information on groundwater flow conditions at the location being tested; and
- Chemical and isotopic analyses of groundwater samples collected from within the borehole, to determine the nature of the groundwater (e.g., whether it is fresh or saline) and to begin to understand how the groundwater has changed over time.



Example of geomechanical testing

As field studies progress, the NWMO will work with people in the area to share information and build awareness and understanding.

How long will it take to complete the borehole drilling and testing?

For a borehole approximately one kilometre deep, the entire process can last about 90 days, depending on the number of shifts worked each day.

Once initial borehole drilling and testing is complete, geoscience, environmental, engineering, and repository safety specialists will need several months to review the data and share the findings with an expert group for peer review. Once that is complete, the NWMO will share findings with the communities. The findings, along with those from earlier studies, will guide the NWMO in working with communities in planning any future study activities.

What happens to the borehole once drilling and testing is complete?

Upon completion of the planned tests, drilled boreholes will be sealed on a temporary basis using hard rubber plugs.

The NWMO will review findings and reflect on whether or not to continue with further studies with people in the area, including the interested communities, and First Nation and Métis communities.

If the decision is taken not to conduct further studies at a borehole location, the temporary seals will be removed, and the borehole will be permanently sealed along its entire length in accordance with MNRF requirements.

If the decision is taken to proceed with further studies in the area, then the temporary plugs could be removed, and the boreholes instrumented.

Instrumentation would be installed in the open borehole to measure and record bedrock properties, such as the water pressures over time frames of months to years. These types of measurements provide additional information about the characteristics of the groundwater systems.

When will a site be selected for a repository?

Confirming a safe site will take several years of progressively more detailed technical, scientific, social, cultural, and economic studies, as well as engagement of people from the area, including the interested communities, and First Nation and Métis communities. The NWMO is conducting studies to explore suitability to host the project in a number of areas in Ontario, including both crystalline rock sites like those found in the area and sedimentary rock formations such as those found in southern Ontario.

If findings from drilling and testing of the initial borehole provide additional confidence that this location may be potentially suitable to host a repository, the communities and the NWMO may decide together to further advance studies at that location by drilling and testing additional boreholes.

If these additional studies increase confidence that the location may be suitable, and if strong partnerships reflecting area support can be developed, detailed site characterization activities could be conducted and would require several more years. During site characterization, the NWMO would collect additional information and complete analyses required to assemble a safety case for a deep geological repository at that location.

Ultimately, the preferred site will need to meet robust technical requirements focused on safety. The implementation of the project must also foster the well-being of the area as defined by people who live there, and will need to be supported by strong partnerships. The project can only proceed with the involvement of the interested communities, First Nation and Métis communities in the area, and surrounding communities.

Be Involved

Be involved in this initial borehole drilling phase of work as we select borehole drilling sites, plan, and complete these studies together.

Drop by your local NWMO community office and participate in upcoming community events such as meetings and open houses.

For more information, please contact:

Manitouwadge Community Learn More Office
3-12 Huron Walk
Manitouwadge, ON, P0T 2C0
807.826.3255

Hornepayne Community Learn More Office
PO BOX 177
247 Third Avenue, Suite 3
Hornepayne, ON, P0M 1Z0
807.868.2186

Nuclear Waste Management Organization
22 St. Clair Avenue East, Sixth Floor
Toronto, Ontario M4T 2S3, Canada
Tel.: 416.934.9814 Toll Free: 1.866.249.6966
Email: contactus@nwmo.ca
Website: www.nwmo.ca