GIANT MINE REMEDIATION PROJECT

Public Forum - March 2025

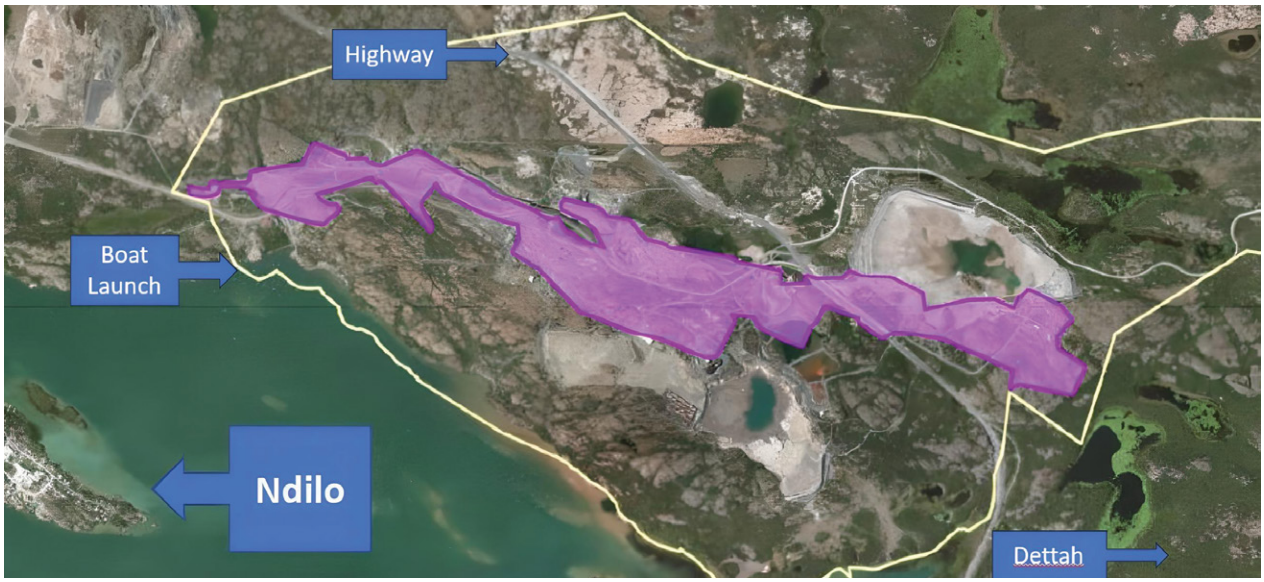
Closing the Underground

Frequently Asked Questions (FAQ)

Government of Northwest Territories

Canada

Aerial view, displaying purple area as overview of underground workings.



1. Where are the underground workings at Giant Mine?

All of the underground workings are located within the Giant Mine Remediation Project boundary, the white boundary line displayed in the image above. The highlighted area in purple represents the underground workings. This area also includes all the chambers and stopes, where the arsenic trioxide dust is stored underground. The underground workings are not located under Great Slave Lake or Ndilǫ, etc.

2. Why was the underground closed?

Closing the underground part of a mine is important for keeping people safe and protecting the environment for future use. Sealing tunnels and shafts to prevent accidents and stabilizing the underground to prevent collapses and avoid surface damage were major steps completed in preparation for closing the underground. These steps ensure the mine meets safety and regulatory requirements while addressing community concerns. By closing the underground, we reduce risks, avoid costly issues, and make it easier to monitor and maintain the site.

Images showing fenced-off open holes underground.

3. When was the underground officially closed?

The underground was officially closed in November 2024.

4. What steps were taken to ensure the underground was closed properly?

To properly close the underground, the following key tasks were completed:

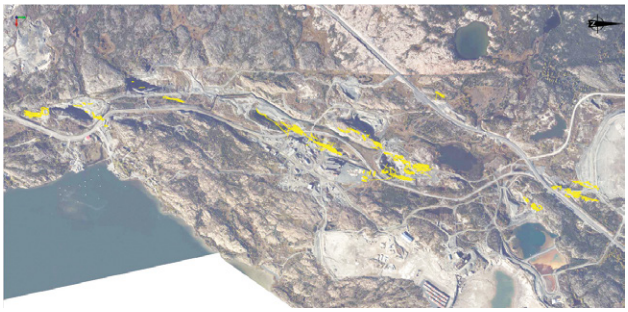
» Filled large near-surface voids using a paste backfill program, highlighted in yellow in image below, to stabilize the underground. This began around 2014 and was completed in 2024.

» Stabilized, cleared and exited underground sections in a coordinated and strategic manner. As work in each underground section was completed, the Care & Maintenance team removed equipment, materials, and supplies, including safety shelters. Each section was then inspected by engineers and other experts.

» Installed mine water intake wells and mine water from the intake wells are controlled from surface to replace underground pumping station.

» The four portals that were used to access the underground have locked doors with broken rock covering the entrance to stop wildlife entering the underground, outlined in red in image. All other shafts and openings to surface have been closed off to prevent access and will be permanently closed over approximately the next two years.

Aerial view, displaying yellow areas where near-surface voids were filled with paste backfill.



Pastefill delivery to backfill underground voids.

Rock-covered portal that leads to the underground.

5. How was waste underground handled?

Waste was managed carefully as per the Giant Mine Remediation Project's approved Waste Management and Monitoring Plan. All operational waste generated by crews working underground was brought to surface and disposed.

Items underground were characterized and disposed of according to approved processes. For example, equipment and materials could be salvaged for re-use and removed from the underground or left in place if determined non-hazardous. Hazardous materials identified such as petroleum products, chemicals, cleaners, fluorescent tubes, microwaves, and unused explosives were removed from the underground, and temporarily placed in the hazardous material storage area on the surface, before being removed from site for disposal at an approved facility. Finally, the underground was re-examined by qualified personnel to confirm that all hazardous materials identified to be removed, had been taken out of the underground.

6. Is there anything that was allowed to stay underground?

Yes. Equipment and materials that did not contain hazardous matter or that could not be salvaged were left in place. Examples include wood waste, concrete and metals (including steel rails, electrical cable, cabinets and steel pipe).

Example image of equipment left underground.

Thermosyphons from freeze optimization study.

7. How is arsenic contaminated waste being handled? Is any arsenic staying underground?

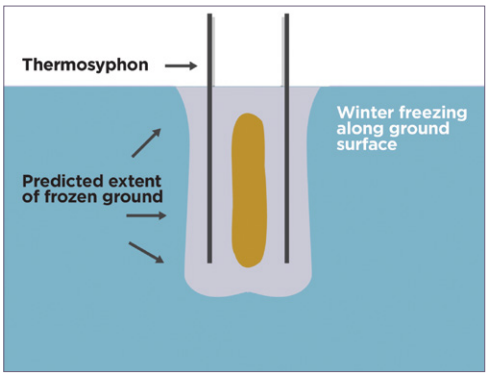
Arsenic-contaminated waste is being handled extremely carefully, adhering to strict protocols for working with this substance.

All arsenic contaminated waste is managed as per the project's approved Waste Management and Monitoring Plan:

- Arsenic piping: previously decommissioned and secured, within the freeze zone.
- Arsenic-contaminated sludge (236 m³): moved to a specially prepared frozen storage zone.
- Underground mine water: will be treated by a new state-of-the-art Water Treatment Plant before it is released, ensuring arsenic is removed.

Materials co-contaminated with arsenic, such as existing used personal protective equipment (PPE), were placed in bags and totes within the planned future frozen zone for arsenic trioxide dust stored in the underground.

Arsenic trioxide dust from previous mining operations will continue to be stored in chambers and stopes underground. These chambers and stopes will be frozen using thermosyphons as per the planned freezing of the underground, and water treatment of the mine water pool will continue for the long-term.



Example diagram displaying thermosyphon freezing process.

8. Has sewage been going to the underground?

Most sewage from Giant Mine site buildings is collected and disposed of off-site at the City of Yellowknife's treatment facility. The exception is a small volume of sewage from the C-dry building (offices) which goes to the underground mine water pool.

The existing situation in which sewage from C-dry is pumped to the underground will be phased out when the building is demolished during active remediation, which is anticipated in 2026. The volume of sewage entering the underground is small as all contractors are required to provide their own facilities and truck sewage off-site. Given that the relative volumes are very low, the project has not detected sewage in the effluent discharge to the receiving environment.

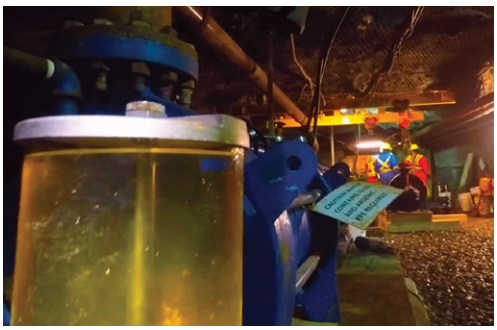


Image of underground sewage area.

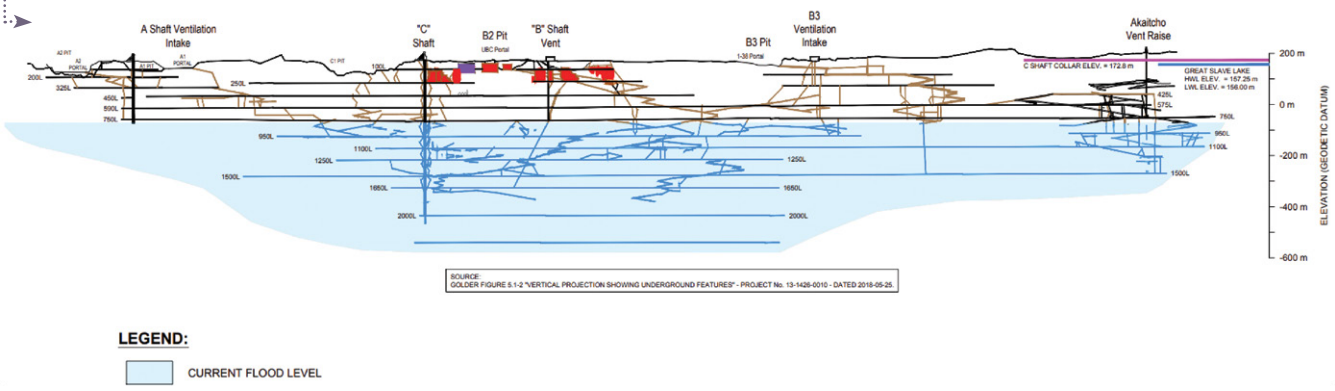
9. Can the underground still be accessed? What happens if someone wants to inspect the underground later?

No, the underground cannot be accessed any more, and all monitoring will be from surface. The four portals that were being used to access the underground are located in open pits that will be backfilled as part of the remediation. In 2026, a new “Long Term Portal” will be constructed if it becomes necessary to access the underground in the future.

10. Will the underground be flooded?

The underground will not be allowed to fully flood. Water pumps will be used to pump water from the underground mine water pool to the Water Treatment Plant. The project is committed to ensure that the water level (highlighted in blue in image below) will stay well below the areas where the arsenic trioxide dust storage chambers exist (red shapes in image).

Cross-sectional diagram of the underground water level (blue) and arsenic chambers/stopes (red).

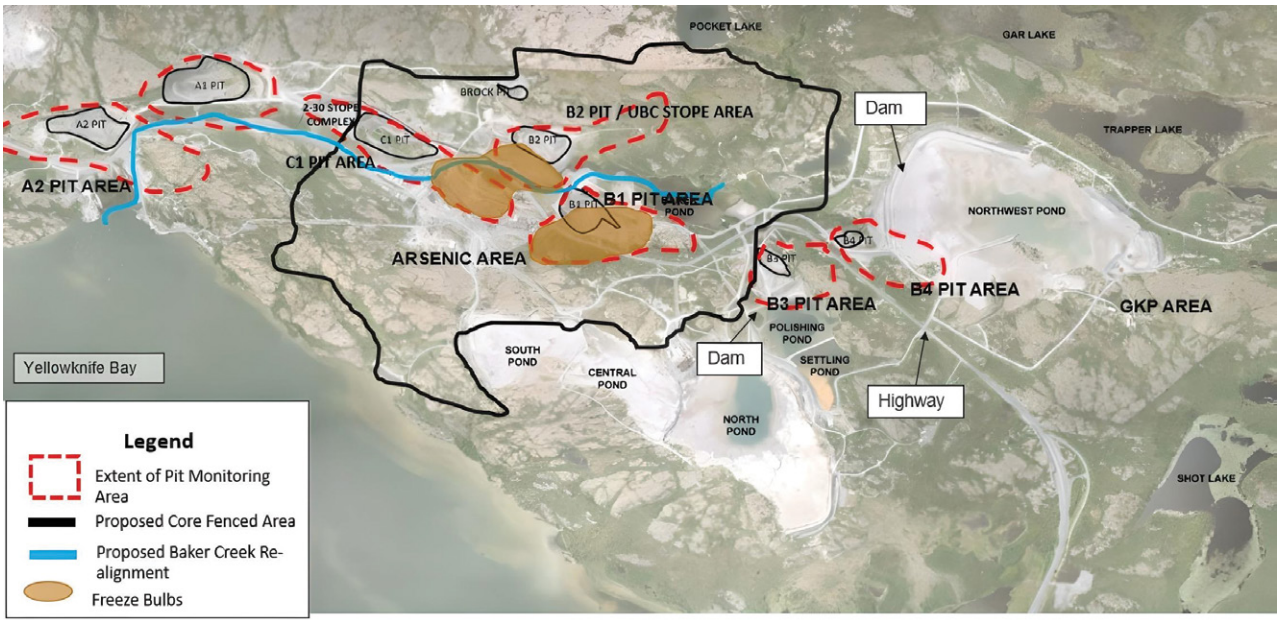


11. What type of underground monitoring will occur from surface?

The project uses remote systems to collect real-time data and monitor the underground. Remote systems monitoring involves taking readings and/or measurements from a distance, i.e. the surface. Types of underground monitoring that occurs currently or in the future, include the following:

- **Thermal monitoring:** to confirm that freeze areas remain securely frozen, using instrumentation, such as thermistors.
- **Water Quality monitoring:** to identify arsenic concentrations through the use of piezometers, wells, and other instrumentation.
- **Geotechnical Stability monitoring:** to confirm that underground stability remains safe, with instrumentation such as extensometers and borehole camera surveys.

Aerial diagram of monitoring zones and proposed fenced core area.



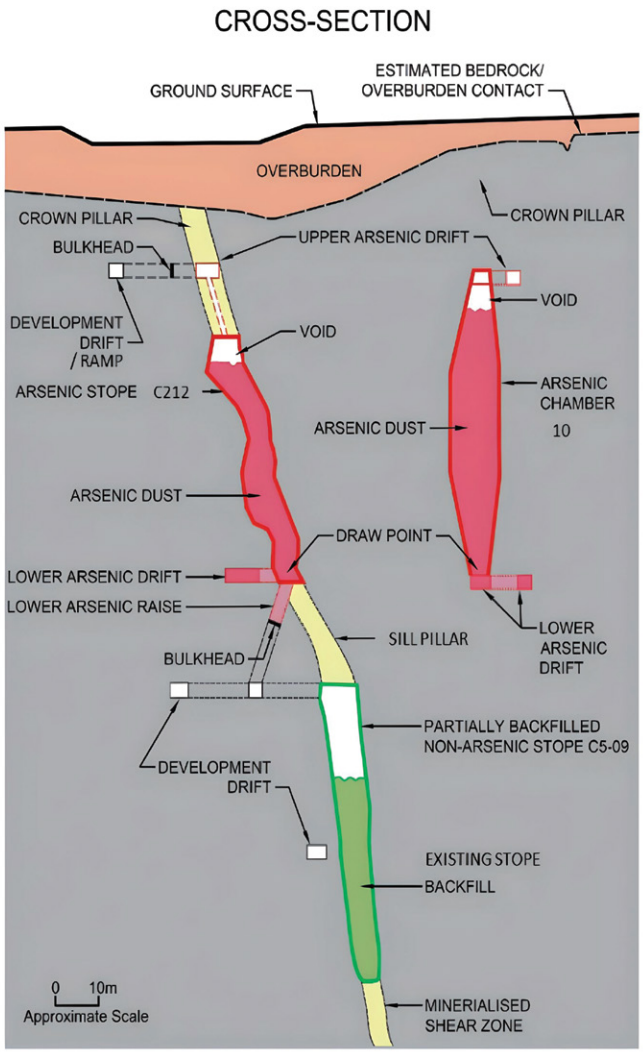
12. Are there concerns about earthquakes or other events that could cause concern for the stability of the underground and the arsenic trioxide dust stored?

No, there are no concerns with earthquakes that could cause stability issues underground. Earthquakes in Yellowknife are uncommon and generally weak. This is because Yellowknife sits on the Canadian Shield, an ancient and stable geological region with very little tectonic activity.

The cemented backfill material was designed to meet a minimum strength that would prevent the underground from turning into a fluid-like mass during an earthquake (i.e. liquefaction). The project design seismic event (earthquake), and testing during construction, confirmed that the backfill material met and/or exceeded the strength requirement. The near-surface voids were filled such that any failure between the voids and surface (i.e. the crown pillar) would not result in a sink hole or other damage at surface that would be harmful to the environment, workers, wildlife, or others.

In addition to backfilling the voids of the chambers storing the arsenic trioxide dust, cemented backfill "plugs" were placed in front of the bulkheads (structure used to hold arsenic trioxide within the chambers) to further protect against release of arsenic trioxide. These plugs were designed to meet a minimum strength that exceeded what would be required to prevent liquefaction during the project design seismic event (earthquake), and testing during construction confirmed the strength requirement was met and/or exceeded.

Once the arsenic chambers and stopes have been frozen, this will further enhance the stability of the underground and reduce the potential for liquefaction of the arsenic dust in the event of an earthquake.



Example cross-section of arsenic stope (C212) and arsenic chamber (10) located underground.

Definition of Mine Terms:

Bulkhead
A stone, steel, wood, or concrete wall-like structure primarily designed to resist earth or water pressure, such as a partition preventing water from entering a working area in a mine.

Crown Pillar
Crown pillar is any rock structure that remains between an underground cave and the ground surface.

Liquefaction
Conversion of soil into a fluidlike mass during an earthquake or other seismic event. Liquefaction can take place when loosely packed, water-logged sediments at or near the ground surface lose their strength in response to strong ground shaking.

Stope
A usually steplike excavation underground for the removal of ore that is formed as the ore is mined in successive layers.

Thermosyphon
Thermosyphon cooling systems use pressure and gravity to transfer gases and liquids and expel heat into the atmosphere.