

Canada advances plan to freeze Giant mine's toxic waste

Frédéric Tomesco - The Northern Miner | July 1, 2025 | 1:45 pm Regulatory Issues Canada Gold



An aerial view of the Giant mine remediation site taken in August 2024. Credit: Adrian Perez.

Canada's C\$4.4 billion plan to cope with a poisonous legacy at a former gold mine in the Northwest Territories risks complicating local efforts to find a permanent solution.

Ottawa is moving ahead with efforts to freeze a 237,000-tonne underground pile of arsenic trioxide dust for at least 100 years at the former Giant mine in Yellowknife, said Natalie Plato, a federal government official in charge of the cleanup. As permafrost thaws, officials see the method as the best way to minimize risks that the waste – a byproduct of gold mining that could fill seven 11-storey buildings and kill humanity several times over – could leak into water systems.

The strategy has met with mixed reactions in the community – including objections from locals who argue that the freeze should only be temporary. The Giant Mine Oversight Board (GMOB), an independent watchdog that makes recommendations on the cleanup and oversees research aimed at solving the environmental issue once and for all, says it “remains convinced” that the arsenic trioxide dust can be extracted and treated safely and successfully.

"We are proceeding with the freeze. It is the best technology and that is what we will be doing. Our project is approved for 100 years, so that's the timeframe we are looking at," Plato, deputy director in charge of remediation at Crown-Indigenous Relations and Northern Affairs Canada, told *The Northern Miner* in an interview. "The freeze is our remediation strategy."

Bankruptcy

Located on a 10-sq.-km site on Yellowknife's northern edge, Giant produced 7.6 million oz. of gold from 1948 to 2004, primarily as an underground operation, before shutting down after miner Royal Oak went bankrupt. Giant – along with the former Con mine – was one of two main gold-mining operations in the city that triggered a post-war economic boom.

"Yellowknife was built because of these mines and you cannot deny that Giant contributed a lot economically and socially, but today it's all about the environmental consequences," Ryan Silke, a Yellowknife-born historian who works at a local museum, said in an interview. "The remediation project is huge. We want this to be done right."

Gold found in the area was lodged in arsenopyrite, a mineral that also contained arsenic. To release the metal, Giant and other mines roasted the ore at very high temperatures – a process that also ejected arsenic gas into the environment. Miners eventually began collecting the dust and storing it underground.

First Nations families using snowmelt for drinking water were sickened in the 1950s and at least one child died from arsenic poisoning. Government studies of the problem didn't begin until the 1970s.

Giant's toxic baggage is one of the elements that gives the story universal appeal, says Christian Broadhurst, a vice president at London-based production house Rare TV. His firm is in the early stages of developing a documentary on the mine.

"The environmental legacy of the Giant mine is shocking," Broadhurst said in an interview. "Wherever you go in the world, there have been communities that have relied on mining and been torn apart by mining. So even though this is a Canadian story, it's one that a lot of mining communities globally can relate to."

Labour dispute

Before becoming known for its arsenic waste, Giant made headlines of a different kind. In May 1992, as Royal Oak was cutting costs to offset declining grades, a bitter labour dispute erupted that saw management bring in replacement workers and union vandalism fester. That September, striking miner Roger Warren went underground and planted a bomb that killed nine workers. It took a year to arrest the culprit.

“The bombing was a watershed event,” Silke says. “Nobody ever accepted responsibility for the events of the strike, and Yellowknifers suffered a lot of trauma with all the violence. Since Yellowknife was a small place, the common social thread was destroyed and the legacy of gold mining really started to wane after that.”

These days, Canada owns the underground portion of the site while the NWT owns the surface land. The property’s eight open pits pose “potential safety risks to workers and the public and risks to the environment from future flooding,” according to a 2024 report published by the Giant Mine Remediation Project (GMRP), the body that’s leading the cleanup.

Ottawa has spent two decades assessing the site, developing a remediation plan and consulting the community. Remediation officially began in 2021 with a test program to freeze the arsenic. It’s expected to run until 2038, after which the site will require maintenance and monitoring in perpetuity.

Mine sealed

Recent work has included stabilizing underground stopes while backfilling the chambers that contain the arsenic trioxide dust with cemented paste. The underground mine was sealed off in late 2024, and the townsite, an area that once housed workers, was demolished and decontaminated.

“Sealing off the underground was a big milestone,” Plato said. “The arsenic dust chambers are located underground and we had to make sure they were secured, vaulted and contained so we could start our freeze program.”

As cleanup work ramps up, costs have climbed. The planned budget for the 2024-25 fiscal year, which ended March 31, was C\$325.4 million, about seven times the fiscal 2019-20 spending, according to GMRP’s latest annual report.

Although expenditures will probably rise again next year, Plato is adamant the overall budget isn’t at risk.

“A peak year for activity is 2026, so (spending) should be levelling” afterwards, she said. “We had our budget of C\$4 billion and we’re still sticking to it..”

While crews press ahead with plans to freeze the arsenic, researchers overseen by GMOB are testing various methods to remove the waste permanently.

Time issue

Marc Lange, one of GMOB's six board members, is optimistic that the research will eventually pay off. The problem is the amount of time it will take.

"It's complex, but we think this nut is crackable," said Lange, an ecologist who was nominated to GMOB by the Yellowknives Dene First Nation. "We think we're making very good strides."

A permanent solution, Lange says, will need to include at least four components – stabilizing the dust, extracting it from below ground, storing it and managing residuals. After that, years of studies, environmental assessments, public consultations and permitting will be required to implement the technology.

That's why Lange estimates GMOB will need at least five years before recommending a permanent method. As for when that solution could be put in place? That might take 25 years.

"And that's a best-case scenario," he said. "So we're not around the corner. But the lens for this project is perpetuity. This is a forever problem, so 25 years from today is pretty good."

Arsenic to glass

Dundee Sustainable Technologies CEO Jean-Philippe Mai, whose company has developed a way to turn arsenic trioxide into glass that's being tested by researchers associated with the project, is growing frustrated.

"It's very disappointing to see the capital that's being injected into a non-permanent solution," Mai said in an interview. "The frozen block model is known by all not to be a permanent model. It's difficult to make sense as to why we're not more advanced on a project of the importance of Giant with a technology that's as recognized as ours."

One of the issues with vitrification is the amount of material – and storage space – required. To make glass, nine teaspoons of sand are needed for every teaspoon of arsenic dust, says Lange.

“When you stabilize the arsenic, it expands,” he said. “So when I’m pulling 237,000 tonnes of arsenic, I need nine times that amount in sand. Where am I storing this?”

Funding, too, could become an issue. If GMOB recommended a different remediation solution than freezing, “it would be a different project and we would have to go back (to Ottawa) for approvals and funding,” Plato said.

Even so, the remediation project head is eager to reassure residents that Ottawa’s plan is the best one for the times.

“The 237,000 tonnes is there and it’s been there for decades,” she said. “I quite feel comfortable, happy and proud to be a Yellowknifer. Into the future, once it’s frozen, I’ll feel quite confident knowing that it’s frozen and that the water will be treated.”

Some residents, like Silke, would like nothing better than to share that optimism.

“Hopefully the project will be good for Yellowknifers,” he said. “The site will look completely different when they’re done. Hopefully the fish will come back and whatever hydrocarbons contamination in the soil will be removed.”