

How has the Port Radium Remediation Project made the site safer for people, animals, and the environment?

The Port Radium Site is a former uranium and silver mine located on a peninsula along the eastern shore of Great Bear Lake in the Northwest Territories, 440 kilometres north of Yellowknife and 265 kilometres east of the Dene community of Délı̨nę within the Sahtú Dene and Métis traditional lands. The site was decommissioned in 1982 to the standards of the day.

Due to more than 40 years of mining, silver, copper and uranium were present in soils and surface water at the immediate site. The site also had waste rock and tailings containing radionuclides—that is, radioactive contaminants. Small amounts of hydrocarbons and asbestos residue were present at the site. Physical hazards, such as mine openings, were the most immediate safety issues at the site.

In 2005, the Canada-Délı̨nę Uranium Table (CDUT) released its final report, which included 26 recommendations for development and implementation of long-term health and social programs. These recommendations also included remediation of the Port Radium Site, to address risks posed by contamination.

All studies and recommendations carried out and developed by the CDUT on how to address the site were done jointly by Canada and Délı̨nę.

Remediation, completed in 2007/08, has made the site safer for people, animals and the environment.



Remediation work at the Port Radium site, August 2007

1. What work has been done to make the site safer?

Remediation work at the site included:

- Improving drainage to reduce leaching of silver, copper and uranium into soils and surface water around the immediate site
- Reducing gamma levels by covering waste rock and tailings
- Removing small amounts of hydrocarbons and asbestos residue
- Covering exposed waste materials, or moving them to a landfill onsite
- Closing mine openings

2. What are the waste rock and tailings made of?

Tailings are a waste product of the mining process, and are made up of sand, silt and clay particles. Since the purpose of the mine was to get as much radium, uranium and silver from the ore as possible, the tailings have very little radium, uranium or silver left in them.

Waste rock is natural rock that was brought to the surface during mining operations, and like the tailings, was left there because it contained almost no radium, uranium or silver.

The most prominent trace metals in both tailings and waste rock are copper, arsenic, lead and zinc.

3. Where are the tailings at the site, and how much is there?

Old mining records tell us that approximately 910,000 tons of uranium tailings and 800,000 tons of silver tailings were produced at the site during the life of the mine.

It is estimated that about 170,000 tons (about 17,000 truckloads) of uranium tailings were placed into natural basins on the site or in the Silver Point area, while the remaining 740,000 tons (about 74,000 truckloads) were dumped into Great Bear Lake right off the shore from the site. Silver tailings were mostly put into McDonough Lake.

Closing the Echo Bay Large Adit

Before starting the remediation work, there were vertical and horizontal mine openings that could have been dangerous to people and wildlife. The Echo Bay large adit was one of the horizontal openings on site.

Workers used rock from other areas at the site to fill the opening.

Once the opening was filled with rock, workers graded the slope to match the surrounding area. Larger rock was placed at the bottom of the slope to help keep the rock in place. New fencing was also put up around areas of potential breakthroughs to the underground workings, to protect visitors and wildlife.

Before



During



After



4. What were the physical hazards at the site, and how were they remediated?

Physical hazards, such as scrap metal and mine openings, were the most dangerous things for someone walking around the site. The major hazards were openings to the underground mine workings. Most of the openings were closed up during the 1980s, but some reopened over time. Some of the openings to the underground mine workings had only old fencing around them, badly in need of repair. There was also a small amount of scrap metal and debris on the site which could have injured people or animals.

These physical hazards were taken care of during the remediation work. Work included:

- Covering vertical mine openings with a concrete cap
- Filling in horizontal openings with rock. In areas where this was not possible, fencing was placed around the areas.
- Demolishing foundations of old buildings, and covering those level with surrounding area
- Removing the dock at Inner Labine Bay, and regrading
- Moving scrap metal to a landfill on site
- Demolishing old wooden structures on site such as the Cross Fault Lake head frame, wooden sheds, and cabins

Removing Scrap Materials from the Dock Wall

Before the remediation work was done, there were the remains of an old dock at Inner Labine Bay. The exposed metal was dangerous, as well as an eyesore. During the consultations with the community of Délı̨ne, it was agreed that this would be cleaned up as part of the remediation.

During the removal of the dock wall, a silk curtain was placed in the bay around the area that was being worked on. This helped make sure that sediment and other material around the dock wall didn't travel into Great Bear Lake while work was going on. The silk curtain was removed, once the work on the shoreline was complete.

After the removal of the dock wall, the shoreline was regraded to match the natural slope in the area. The materials that were removed were placed in the landfill, away from Great Bear Lake.

Before



During



After



5. What were the radiation concerns at the site, and how were they remediated?

Human health and ecological risk assessment studies were done at the site to find out how much radiation people and animals would be exposed to by being at the site, or by eating vegetation and animals there. The results of the studies show us that a low level of radionuclides—radioactive contaminants—are present at the Port Radium mine site. The levels are safe for people or animals visiting the site for a period of up to three months per year.

6. What were the concerns about heavy metals, and how were they remediated?

While testing for radionuclides—radioactive contaminants—samples from the Port Radium site were also tested for 25 other non-radioactive elements, such as heavy metals. Before the remediation work was done, tests showed us that there were elevated levels of copper, arsenic, lead and zinc in exposed tailings, in vegetation growing over top of tailings, and in water pooling on top of tailings. This was a concern for certain types of animals using the site, but not for people.

There were several places at the site where water containing metals was draining into Great Bear Lake. There are also places where

Covering areas with elevated levels of radionuclides - Silver Point Causeway

As an added precaution, a decision was made to cover areas with the highest radiation levels, such as the causeway and Silver Point, with half a metre of clean soil, which reduced the radiation to a safe level.

A natural soils cover was put over areas of concern to reduce radiation levels.

Slopes were regraded to match the natural sloping in the area.

Before



During



After



tailings had been put into the lake. Water samples taken from the lake at the site showed that there are some heavy metals in the water. However, this is only true for water right next to the site. Samples taken farther out from shore show us that the water quality there is good.

The remediation addressed the main onsite sources of exposure for animals, particularly exposed tailings releasing metals in surface water, by covering the tailings with a layer of waste rock.

7. Why were hazardous and/or contaminated materials left at the site, instead of being removed?

Hazardous Materials

When the Port Radium and Echo Bay mines closed in the 1980s, most of the mine workings and buildings were removed. For example, all buildings on the site were taken down or burned onsite. That meant there wasn't much hazardous material left. What was left, including small amounts of asbestos from those buildings, was buried on site in safe locations using safe methods, as part of the recent remediation work. As these materials could be safely taken care of on site, there was no need to remove them.

Covering tailings and improving drainage at the Silver Point Tailings Area

Before doing the remediation work, there was water pooling on the tailings cap. This water was picking up heavy metals. At certain times of the year, the water would overflow into Great Bear Lake, carrying these heavy metals into Cobalt Channel.

To fix the problem, the pools were filled in with clean tailings and native soils. A layer of geotextile liner was then placed over the entire tailings area to prevent water from entering the tailings. Then, the liner was covered with rock to protect it.

This rock-covered geotextile will keep rain and other moisture from getting to the tailings underneath, and keep heavy metals from flowing into Cobalt Channel.

Before



During



After



7. Continued

Waste rock

Though the waste rock on site is not nice to look at and means that the land was disturbed, it is not dangerous. Areas of waste rock with slightly elevated radiation levels were covered with uncontaminated fill as part of the remediation work. This was done to lower surface radiation, to make it safe for people or animals to visit the site for a period of up to three months per year.

Tailings on land

Most of the tailings on land are sitting in stable areas, such as natural basins, and have been covered up with waste rock. During mining operations, tailings were placed in McDonough Lake tailings containment area (TCA), but no water flows out of it. As it is a stable containment area, there was no need to remove the tailings.

Tailings in the water

A survey of the lake bottom around the site was carried out using sonar and underwater cameras in order to provide a picture of where tailings are located, to see if they might be moving. The survey showed that tailings are in deep pockets in the lakebed in the area around Port Radium, and researchers think tailings in these locations will not be disturbed. Water currents cannot spread the hazardous waste in Great Bear Lake.

8. Did radionuclides and heavy metals at the Port Radium site spread in the years before the remediation work was done?

No. Environmental testing shows us that radionuclides and heavy metals at the Port Radium site remain on or near the site, and have not spread.

Air sampling showed us that there were no radionuclides in the air, so they were not spread in this way.

Water samples taken from Great Bear Lake at the site showed us that there are some heavy metals in the water, from water running off the tailings and waste rock into the lake before the remediation work was done, and from tailings on the lake bottom. However,



Pouring concrete to cap a mine opening, Port Radium, 2007

samples taken further off-shore showed good overall water quality in Great Bear Lake.

9. Is the site safe to visit now?

Yes. There were several mine openings that made it unsafe for people to walk around the site. These openings were covered over as part of the remediation work.

The Human Health and Ecological Risk Assessment tells us that a person can stay at the site for up to three months per year, every year, without suffering any health effects from exposure to heavy metals or radionuclides. This includes eating edible plants and animals at the site, and drinking water from Great Bear Lake.

10. How did researchers figure out radiation levels at the site?

Researchers, remediation workers and visitors wore radiation badges called dosimeters when at the site. Afterwards, these badges were sent to Health Canada and examined. All badges showed that people had received doses that were less than what would even show up on the badge (less than 20% of the public dose limit).



Barge with equipment and supplies for remediation work, Port Radium, 2007

11. How were workers protected from radiation during the remediation work?

Site remediation work was planned to make sure workers were exposed as little as possible, and anyone involved in the clean-up activities at Port Radium took training to learn about radiation risks. Radiation monitoring during the cleanup was also required.

12. Can we eat fish and animals caught in the area? In other areas in the Sahtú?

Yes. There is no risk to humans from eating traditional foods taken from Port Radium, including caribou.

Levels of radiation exposure through a diet of traditional foods in and around Déłı̨nę is the same as through naturally-occurring levels in other areas of the NWT, and at levels too low to cause human health effects.

The metal and radionuclide levels in Great Bear Lake near shore waters are very low, and do not affect the fish.

Arsenic, copper and uranium levels in water in the McDonough Lake tailings containment area (TCA) were not healthy for some types of



Sign at the Port Radium site, notifying visitors that the site is subject to a Waste Nuclear Substance License

aquatic life, such as fish. A fisheries study in 2006 showed that there are no fish in the McDonough TCA. It should also be noted that there is no outflow of water from McDonough Lake into Great Bear Lake.

Higher levels of cobalt and uranium in the Cobalt drainage area, Murphy Tailings and the exposed tailings near Murphy Bay could have affected local species such as the hare. After remediation, studies show us that radionuclides at the Port Radium mine site are no longer of concern to human health, animals or the environment at the site.

13. How is the site being monitored, now that the work is complete?

Long term monitoring is a very important commitment in the Port Radium Remediation Plan. For the first four years of monitoring, inspectors will travel to the site twice a year to make sure that the site remains in a stable condition, and that the remediation solutions are working. As well, water will be sampled at the site once a year.

In year five of the monitoring program, inspectors and researchers will do a more detailed study of the site. They will look at the health of fish in the Great Bear Lake area around Port Radium, as well as the plants and the soil. They will also examine sediments in Great Bear Lake close to the site. Finally, researchers will do a complete gamma survey of the entire Port Radium Site, to make sure that the radiation covers are working the way they are supposed to.

Depending on the results of the study, the monitoring plan will change. If the results of the monitoring program show that site conditions are stable, then inspectors will continue to monitor the site once every two years, to look at the water quality, the conditions of the site, and to study the health of the fish, and what the fish eat, in the area around Port Radium. Traditional foods will also be examined every five years to make sure they remain safe to eat.

In addition, the site is covered by a Waste Nuclear Substance License, from the Canadian Nuclear Safety Commission, and is being monitored by them forever. INAC must file reports every year with the Commission. Signs will remain posted at the site to let people know that access is restricted. Community members have been told of the site restrictions, as have others, such as industry and exploration companies operating in the area.

14. Were other abandoned mines in the area remediated at the same time?

Yes, remediation work was also done at the near-by Echo Bay and Cross Fault Lake mine sites.

Training and Employment – a Benefit to Déłı̨nę!

Déłı̨nę beneficiaries were an active presence working on site at Port Radium during the remediation project.

Initially, a training program took place in Déłı̨nę in 2006/07, including courses on first aid, handling of hazardous materials, small craft operation and fire arms safety.

Community members were employed through Aboriginal Engineering Limited, the remediation contractor, in the areas of equipment operation, asbestos removal, demolition and supervisory skills.

Throughout the contract, Aboriginal Engineering Limited maintained an average of 75% local employment.

INAC, along with Déłı̨nę and the Tłı̨chǫ Government, is developing plans to remediate Silver Bear Properties, Contact Lake and El Bonanza/Bonanza mines, and the Sawmill Bay military staging site. This means more work for those with the right skills, and that's good news for Déłı̨nę!

Workers laying the geotextile liner at the Silver Point Tailings Area, July, 2007



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Déłı̨nę community members and INAC staff, Port Radium, August 2008

