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# THE **BIG** PICTURE

Yukon's Large Contaminated Sites

Canada

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**Canada** 

## The Big Picture

This booklet is about the seven mine sites in the Yukon Territory that were identified in the Devolution Transfer Agreement (DTA) as Type II mines. It describes some of the activities undertaken by Indian and Northern Affairs Canada (INAC), the Government of Yukon, affected First Nations and other partners to clean up these sites.

You'll find information about the remediation process including descriptions of some of the contaminants and hazards involved. As well, *The Big Picture* provides an update on current activities occurring at these sites and what INAC, Yukon government, First Nations and their partners are doing to ensure their proper closure.

Currently four of the seven sites are jointly managed by the Government of Canada and the Government of Yukon in cooperation with First Nations. They are Faro, Mount Nansen, Keno Hill Mine and Clinton Creek. In the case of Keno Hill, the property owner also plays a role in cleanup and closure activities as well as ongoing care and maintenance at the site. The other three sites are under owner-operator care and regulated by the Government of Yukon, however, they would return to government care if abandoned in the future. They are Minto, Ketzka River and Brewery Creek.



## Managing Relationships

When the DTA came into effect on April 1, 2003, the Government of Yukon took province-like responsibility for managing the territory's public lands, water, mining and forestry, including contaminated sites. Large mine sites that have significant potential for unfunded environmental liability were identified in the DTA as Type II mine sites.

The Government of Canada, through INAC, continues to pay a share of the costs for the cleanup of contaminated sites in the Yukon, including Type II mine sites, but only when the activity causing the contamination occurred prior to April 1, 2003.

Today, INAC Yukon Region is working with the Government of Yukon to ensure the remediation of four of the Type II sites, while

also carrying out the remediation of smaller contaminated sites and waste sites under the guidelines of the Contaminated Sites Management Program. Substantial progress has happened under this program as over 600 of the original 900 identified sites have been cleaned up to date.

### **Type II Mine Sites: Shared Responsibility**

To effectively manage these large, complex sites and to ensure local participation and benefits, several levels of government are working together.

The Government of Canada is responsible for the financial costs – as “funder”. The Government of Yukon is responsible for the care and maintenance of the abandoned

sites – as “implementer”. Together, the two governments and affected First Nations are working on closure and remediation plans for four of the seven sites.

The overall plan is to bring these mines to closure as soon as possible, reducing environmental and human health hazards, involving First Nation governments in the process, and maximising benefits for First Nations and Yukoners through employment opportunities.

### **Working Together**

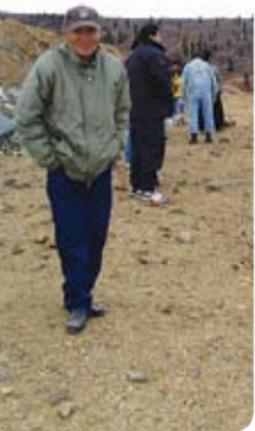
In the spirit of cooperation, the Government of Canada and the Government of Yukon have established a close working relationship for overall coordination of work related to these sites.

## Managing Relationships

### Governments' Objectives

Together the federal and Yukon governments have established general closure and remediation plan objectives for Type II mine sites that are under their care.

- Protect the health and safety of Northerners
- Protect and, to the extent practical, restore the environment, including land, air, water, fish and wildlife
- Return the site to an acceptable state of use that reflects pre-mine land use where possible
- Maximize local and Yukon socio-economic benefits
- Manage long-term site risk in a cost effective manner



## Life Cycle of a Mine

### There are phases of mineral resource development and abandoned mines:

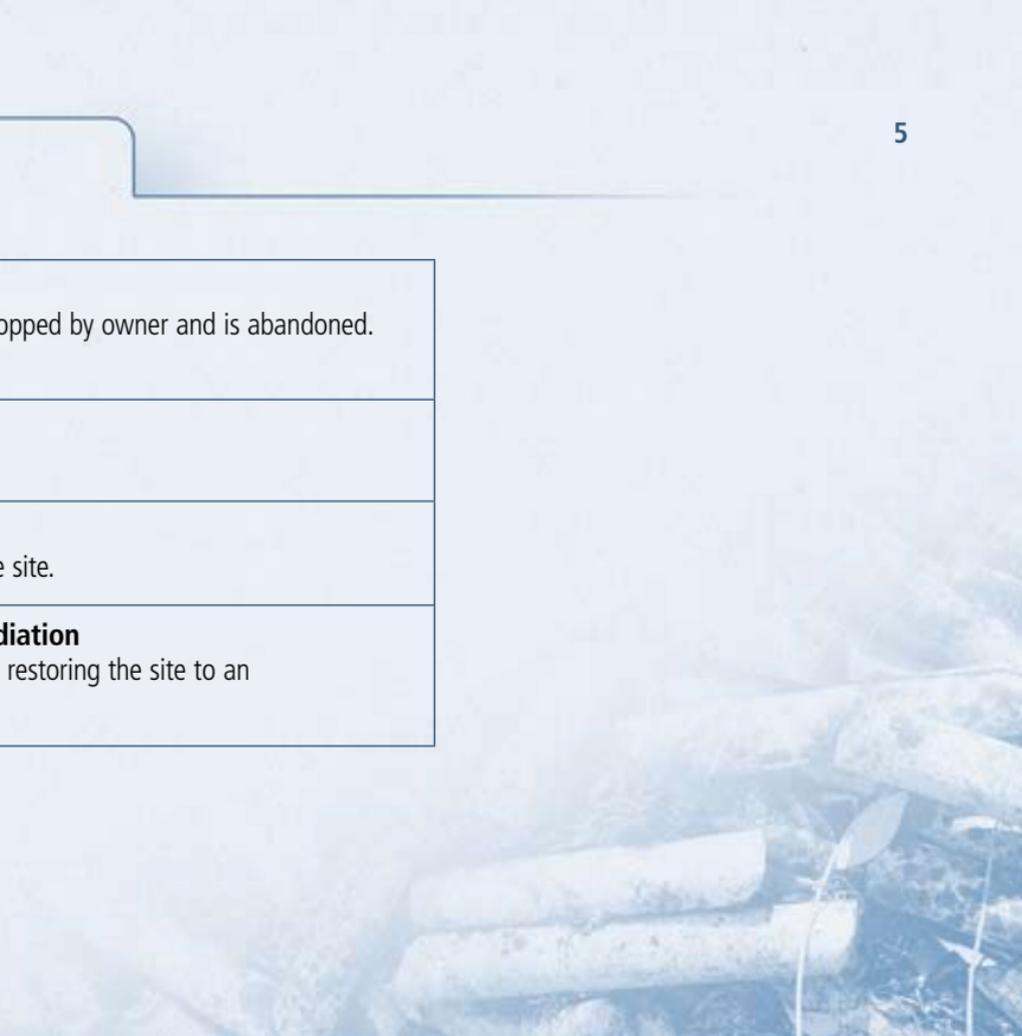
<b>Phase One</b>	<b>Exploration</b> Researching, conducting assessment, verifying anomalies, prospecting and conducting ground surveys.
<b>Phase Two</b>	<b>Mineral Deposit Appraisal</b> Defining the characteristics of the deposit; establishing the technical feasibility; evaluating the economic, financial, socio-political elements of the project; making production decisions and obtaining permits.
<b>Phase Three</b>	<b>Mine Complex Development</b> Completing construction of the mine site.
<b>Phase Four</b>	<b>Production</b> Entering the commercial production phase to achieve profitability, marketing and renewal of reserves.

Four of the seven Yukon Type II mines (Faro, Mount Nansen, Keno Hill Mine and Clinton Creek) are between the Mine Abandonment and the Environmental Restoration and Remediation phase. These mines, with the exception of Clinton Creek, are under care and maintenance contracts while closure planning is underway. Keno Hill is privately owned and is pursuing commercial opportunities but remains partnered with the governments for care and maintenance.

The other three mines (Minto, Ketz River, and Brewery Creek) are exclusively under owner-operator care and are at various stages of mine development, including the ongoing Environmental Restoration and Remediation.

## Life Cycle of a Mine

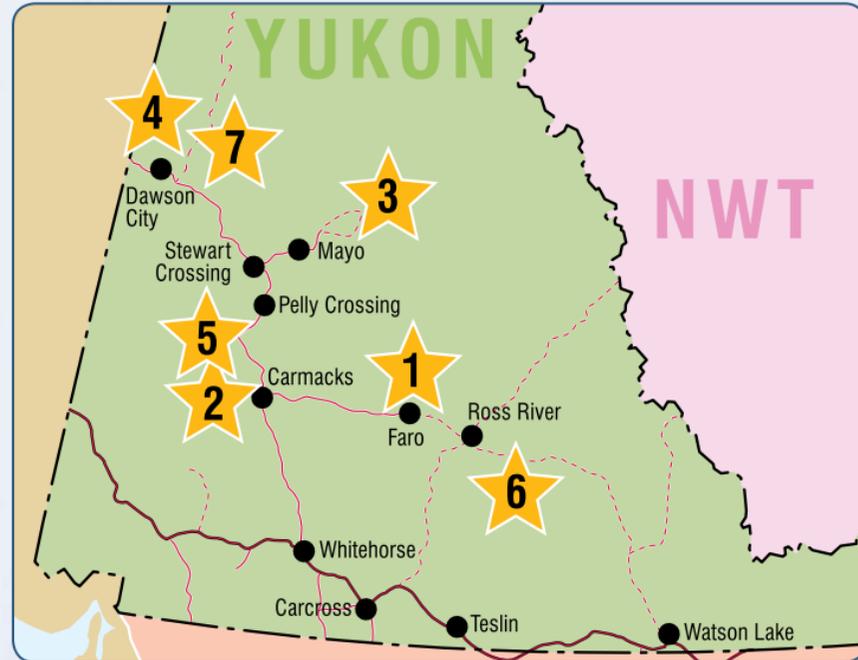
<b>Phase Five</b>	<b>Mine Abandonment</b> Operating and responsibility for the mine stopped by owner and is abandoned. Government takes over mine site.
<b>Phase Six</b>	<b>Care and Maintenance</b> Ensuring no ongoing environmental harm.
<b>Phase Seven</b>	<b>Site Assessment</b> Determining the environmental issues at the site.
<b>Phase Eight</b>	<b>Environmental Restoration and Remediation</b> Closing and decommissioning the mine and restoring the site to an environmentally acceptable condition.



## The Seven Type II Sites

### The seven Type II mine sites are:

1. **Faro Mine** – currently under receivership care, but will be transitioning to Government of Yukon
2. **Mount Nansen** – under care and maintenance and closure plan development
3. **Keno Hill** – the property owner is involved in the care and maintenance of the site as well as the cleanup and closure activities
4. **Clinton Creek** – abandoned, under joint territorial and federal government care
5. **Minto** – currently under owner/operator care
6. **Ketza River** – currently under owner/operator care
7. **Brewery Creek** – currently under owner/operator care



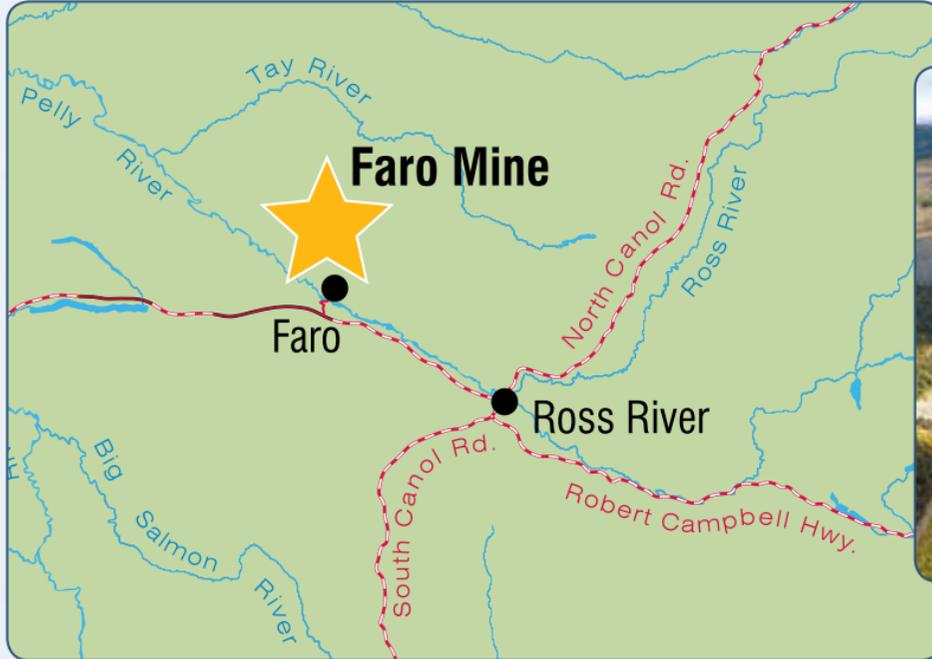
## Sites under Government Care

The following four sites were identified as being Type II mine sites at the time of devolution because of their potential for unfunded environmental liabilities at the time of closure. They were deemed to potentially pose substantial damage to the environment and thereby a financial liability to government.

- **Faro Mine**
- **Mount Nansen**
- **Keno Hill**
- **Clinton Creek**



# Faro Mine



## Faro Mine

For many years, the mine near the Town of Faro produced lead, zinc, silver and gold. The mine opened officially in 1969 and Cyprus Anvil Mining Corporation, the owner quickly became the largest private sector employer in the Territory. It also represented well over a third of the economy of Yukon, and by the mid 1970s was the largest lead/zinc mine in Canada. At one point, for a brief period, it was even the largest operating open-pit lead/zinc mine in the world.

The Faro Mine complex, with a footprint of over 25 km<sup>2</sup>, consists of three distinct areas: the Faro Mine area (incorporating the Faro pit, mill, and associated buildings), the Rose Creek tailings impoundment situated in Rose Creek Valley, and the Vangorda Plateau (incorporating the Grum and Vangorda pits).

The Faro Mine area and the Vangorda Plateau are connected by a 13 km heavy haul road. This road was used to truck ore from the Vangorda and Grum pits to the Faro mill for processing. The lead and zinc concentrates that were produced included economic quantities of silver and gold, and were shipped to international smelters via Skagway, Alaska.

The Faro Mine complex is the largest of the seven Type II mines in the Yukon.

### Why is it of concern?

Metals such as zinc and lead occur naturally in the rocks around Faro. Elements like rain and wind can release these metals from the rock through the weathering process. Before the mine opened, weathering was slow and the

naturally released metals had no serious effect on the plants and animals in the area.

Because of almost 30 years of mining activities, there are now approximately 70 million tonnes of tailings and 320 million tonnes of waste rock located across the mine complex. These materials have the potential for generating acid and releasing metals into the water.

In addition, certain bacteria thrive on energy stored in rocks that contain sulphur. As they use this energy, the bacteria create heat and can increase the amount of acid/metals released from these types of rocks. This is called acid rock drainage and it is a substantial challenge at the site, because these contaminants can be transported by



## Faro Mine

water and can have negative impacts on the surrounding aquatic ecosystem.

Since 1998, the Government of Canada has paid for care and maintenance work carried out at the site by the court appointed Interim Receiver, Deloitte & Touche Inc. This work includes water treatment so that water flowing from the site meets acceptable standards. It also includes regular inspection and maintenance of all structures on the site.

### **How will it be remediated?**

In January 2003, the federal and territorial governments acknowledged that the Faro Mine complex would not reopen. The two governments then entered into a joint agreement with the Ross River Dena Council (on behalf of the Kaska Nation) and Selkirk First Nation to work together on the

development of a closure and remediation plan for the entire site.

The Government of Canada, Government of Yukon, Selkirk First Nation and Ross River Dena Council (on behalf of the Kaska Nation) took a collaborative approach to developing the closure objectives for the Faro Mine complex. These five overarching objectives define the desired results of a closure plan and guide the entire planning process. This process is designed to be open and transparent and share information to support community understanding and involvement.

The two governments, working closely with the affected First Nations, are developing a closure and remediation plan for the Faro Mine complex. This plan will be submitted to the appropriate assessment and regulatory



## Faro Mine

authorities as well as final decision makers and, if approved, will form the basis for securing funding for carrying out remediation work.

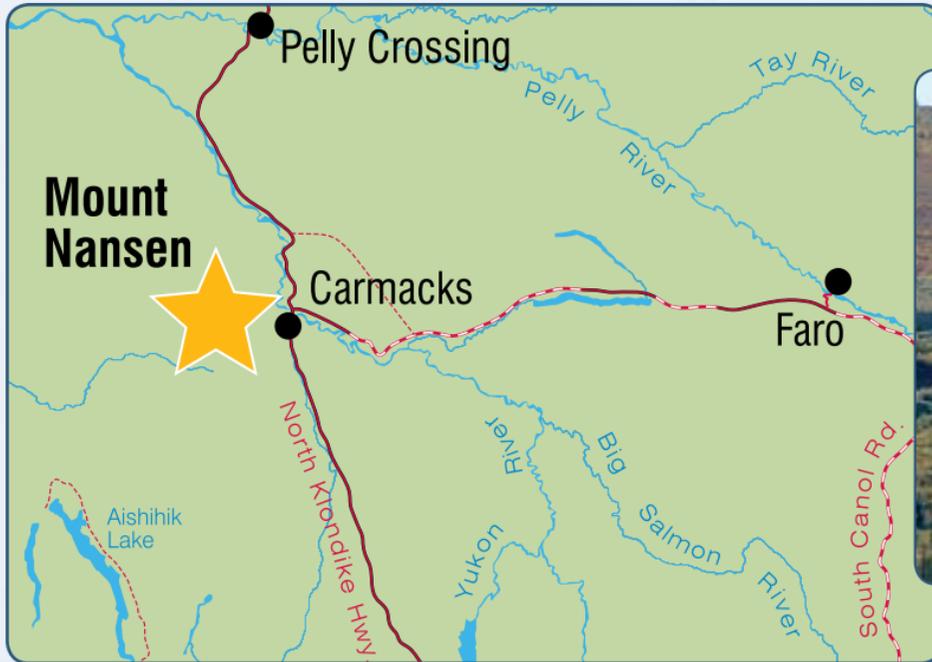
The Faro Project Management Team, which includes core management, technical, communications and administrative staff, has been set up based in Whitehorse and is actively developing the closure and remediation plan. There are also community-based First Nations offices in Ross River (Kaska) and Pelly Crossing (Selkirk), as well as a liaison officer in the Town of Faro.

A number of expert contractors are also providing significant levels of engineering, technical and administrative support necessary for the timely preparation of a closure and remediation plan.

To learn more about the closure planning process and for detailed information on the Faro Mine complex visit [www.faromineclosure.yk.ca](http://www.faromineclosure.yk.ca).



## Mount Nansen





## Mount Nansen

Since the 1960s, people have been mining gold and silver off and on at the Mount Nansen site. In 1995, new operators tried again to turn the mine into a viable commercial operation. Operating intermittently for the next three years, the mine finally closed down in 1999 due to the inability of the owners, BYG Natural Resources Inc., to meet the water licence requirements. A court appointed Interim Receiver, PricewaterhouseCoopers, is managing the assets, while the Government of Yukon is managing the care and maintenance at the site.

Located 180km north of Whitehorse near the village of Carmacks, the Mount Nansen mine site lies within the traditional territory of the Little Salmon Carmacks First Nation.

### Why is it of concern?

When the site was abandoned, the tailings pond contained high levels of cyanide and metals. The pond was also in danger of spilling over the dam, which was in poor condition, threatening the Nisling River system.

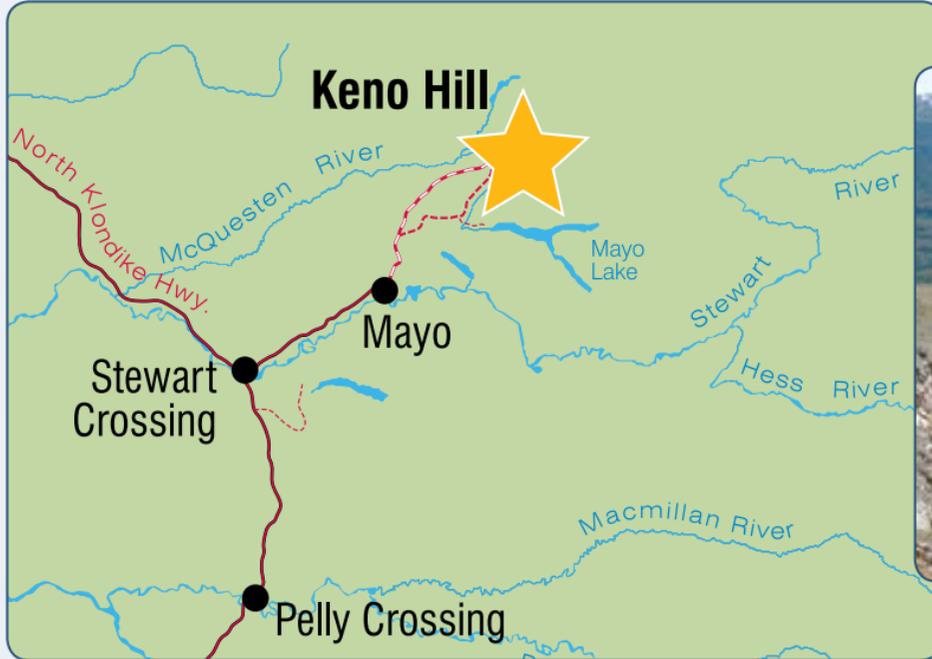
A great deal of work has already taken place to address these immediate risks. Every summer, water is pumped out of the tailings pond, treated if required, and discharged. The pond now holds much less water and shows low levels of cyanide.

Other physical hazards at the site include the open pit and the underground tunnels. Signage has been placed around the pit warning people of the hazards.

### How will it be remediated?

The mine is permanently closed and the governments of Yukon, Canada and the Little Salmon/Carmacks First Nation are working together to cleanup the site and are developing and will implement a final closure plan. This process involves defining closure objectives, identifying closure alternatives, developing a plan for the preferred alternative, proceeding with the environmental assessment and permits, implementing the closure plan and monitoring the site.

## Keno Hill



## Keno Hill



Since the days of the gold rush, miners have been hard at work extracting silver, lead and zinc from the Keno Hill Mine site. The property is spread out over 15,000 hectares, with nine distinct mines and dozens of different shafts and adits. Located in Elsa, 55 kilometres northeast of Mayo, it is situated in the traditional territory of the First Nation of Nacho Nyak Dun.



The site was last owned by United Keno Hill Mines Ltd., which declared bankruptcy in 1999. The mine was placed into receivership in 2004 after unsuccessful attempts to sell the mine by creditors. In April 2006, the sale of the mine was approved by the Yukon Supreme Court to Alexco Resources Corporation.

The sale was a two-phased process after the initial approval by the court. Alexco was granted access to the site for exploration and to undertake the day-to-day care and maintenance of the site.

In November 2007, the sale of the mine to Alexco was finalized when the company received approval for a water license. This approval gives the company responsibility for ensuring that the site remains in compliance with the terms and conditions of the water license. The Government of Canada will continue to provide funding.

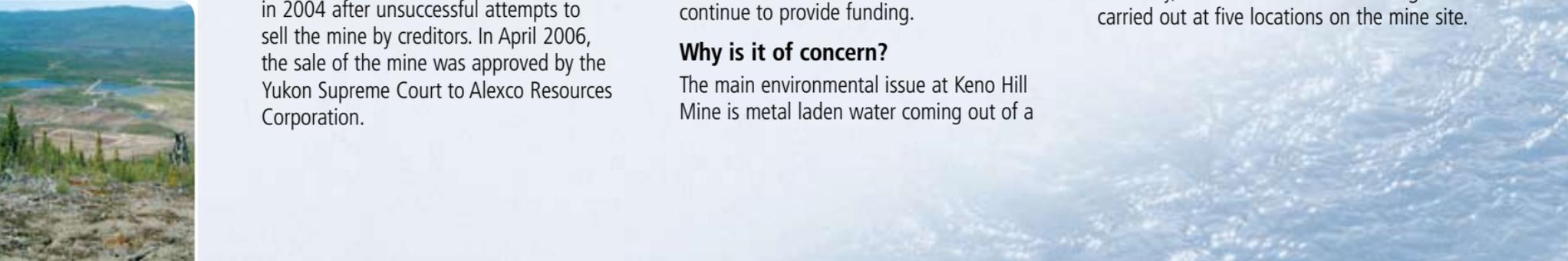
### Why is it of concern?

The main environmental issue at Keno Hill Mine is metal laden water coming out of a

number of old adits or underground tunnels and from the Elsa Mill tailings pond. The key concern is with zinc as it is harmful to fish. High metal levels impact aquatic habitats in the area, including Christal and Flat creeks, Christal Lake and the South McQuestin River.

### How will it be remediated?

Under the agreement for sale with Alexco, the company and the territorial, federal and First Nation governments are responsible for developing a closure plan for the site. Currently, active water treatment using lime is carried out at five locations on the mine site.



## Clinton Creek



## Clinton Creek

Clinton Creek was an asbestos mine located 100km northwest of Dawson City in the traditional territory of the Tr'ondëk Hwëch'in First Nation. It was owned by Cassiar Asbestos Corporation, which was purchased by the Princeton Mining Corporation in 1991. Approximately 16 million tonnes of serpentinite rock containing 940,000 tonnes of asbestos were removed from three open pits at the mine site. Over 60 million tonnes of waste rock was deposited over the south slope of the Clinton Creek valley and approximately 10 million tonnes of tailings were deposited along the west side of Wolverine Creek.

### Why is it of concern?

In 1974, the Clinton Creek waste rock dump failed resulting in a slide that blocked the

creek and created Hudgeon Lake. The lake is 115 hectares in size and is up to 25 metres deep. The primary concern at the site is that heavy rains or a quick snowmelt in the spring could accelerate erosion of the lake outlet and lead to sudden and significant downstream flooding. This erosion could drain the lake in a short period of time, the effects of which would be felt all the way to the Forty Mile River. Anyone downstream of the lake would be at risk of getting caught in the flood.

### How will it be remediated?

The issues described above have been addressed. To stabilize the creek below Hudgeon Lake, rock filled gabion baskets were constructed to ensure the creek does not erode back to the lake outlet. The

baskets are monitored and maintained on a yearly basis. Signage and berms have been constructed around the pit perimeter to warn people of the open pits.

The mine is closed and the governments of Yukon, Canada and the Tr'ondek Hwech'in First Nation are working together to clean-up the site and implement final closure. Although major efforts at this site are nearing completion, monitoring to ensure continued erosion control of waste rock dumps is required and ongoing.

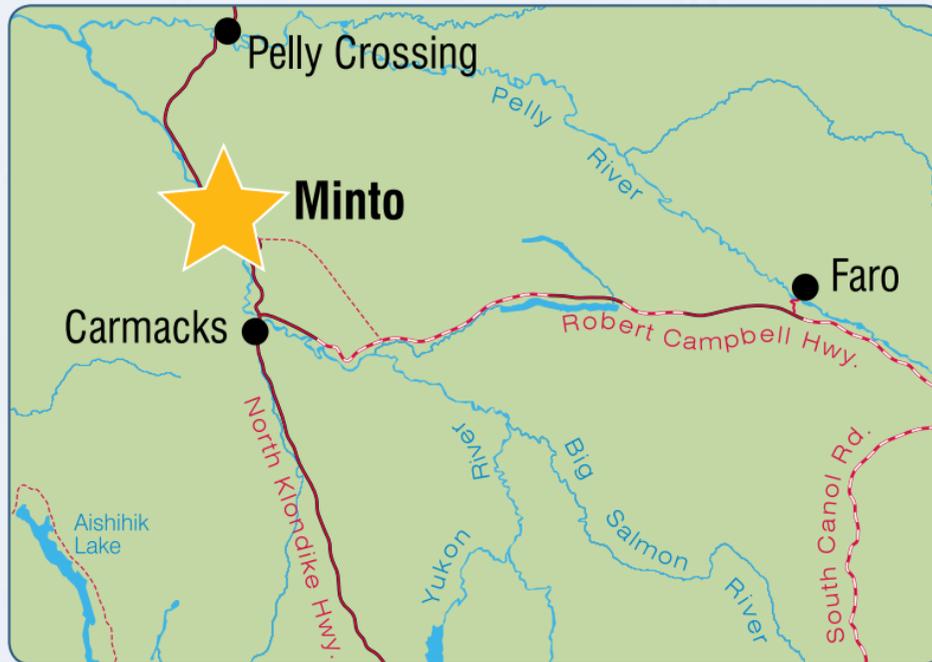


## Sites Under Owner/Operator Care

The following three mines, while classified as Type II because of their potential for unfunded environmental liability, are under owner/operator care and regulated through the Government of Yukon as they proceed towards mineral development or closure.



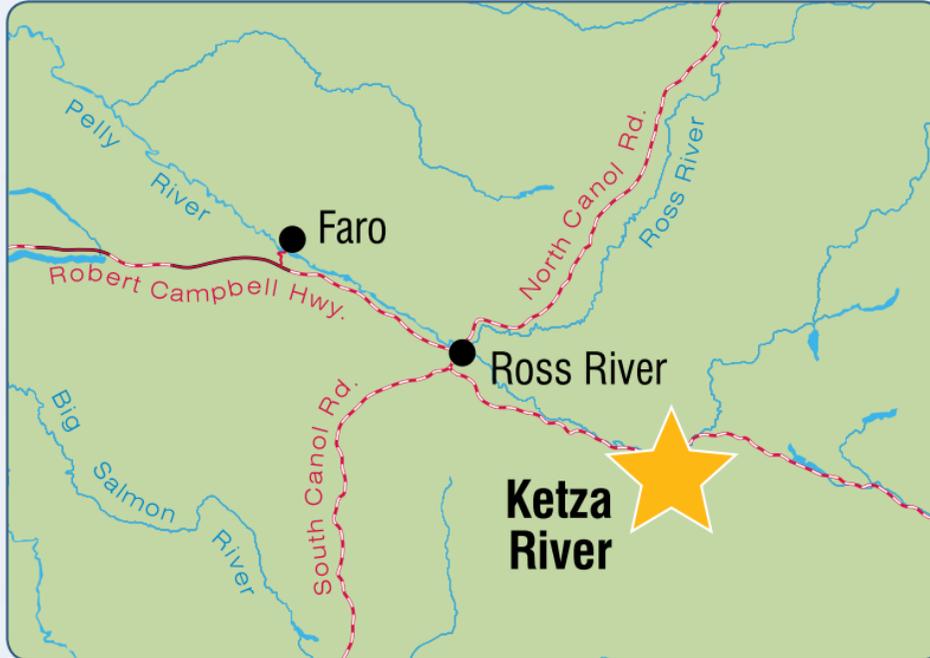
## Minto



Minto is a copper, gold and silver mine owned by Minto Explorations, a subsidiary of Sherwood Copper Corporation. It is under the care and maintenance of the owner. The mine site is located 75km northwest of Carmacks in the traditional territory of the Selkirk First Nation.

In 2005, Sherwood received a ten-year extension of its water licence to June 30, 2016, which allows it to construct and operate a mine at Minto.

## Ketza River



Ketza River was a gold and silver mine located 85km south of Ross River in the traditional territory of the Kaska Dene people. It is owned and under the care and maintenance of Yukon-Nevada Gold Corporation Resources Limited (YGC). Exploration is currently ongoing.



## Brewery Creek



Viceroy Brewery Creek was a gold mine located 55km east of Dawson City in the traditional territory of the Tr'ondëk Hwëch'in First Nation. It is owned and is under the care and maintenance of Alexco Resources Corporation.

The property was operated as an open-pit heap-leach mine until 2002, when the mine was closed due to low gold prices. Alexco's senior management team completed reclamation of the mine in 2005, twice winning the Robert E. Leckie Award for outstanding reclamation.

## Glossary of Terms

### Acid Rock Drainage

Acid-generating waste rock and tailings are commonly referred to as acid rock drainage or ARD. During mining, rock is disturbed and metals contained in the rock become exposed to oxygen and the environment. This can lead to the creation of an acidic environment which can be transported by water.

### Adit

An opening driven horizontally into the side of a mountain or hill for providing access to a mineral deposit.

### Asbestos

A strong and incombustible fibre widely mined in the past for fireproofing and insulation.

### Contaminant

Any physical, chemical, biological or

radiological substance in the air, soil or water that has an adverse effect. Any chemical substance with a concentration that exceeds background levels or which is not naturally occurring in the environment.

### Cyanide

This is a chemical added during the floatation process to separate gold from ore. Cyanide is brought to the site as a powder. After it is used in the floatation process, it ends up in tailings and tailings water.

### Devolution

The transfer of lands previously under the management of the Northern Affairs Program of Indian and Northern Affairs Canada (INAC) to the Yukon government. Devolution of these responsibilities took place on April 1, 2003.

### Devolution Transfer Agreement (DTA)

Details the responsibilities and obligations associated with the transfer of resources previously under the management of Indian and Northern Affairs Canada to the Yukon government. Devolution of these responsibilities took place on April 1, 2003.

### Diversions

An artificial or "human-made" channel that changes the natural course of a creek or a stream.

### Gabion

A basket or cage filled with earth or rocks and used in building a support or abutment.

### Milling

The process used to separate metals from ore.



## Glossary of Terms

### Open Pit Mine

A form of operation designed to extract minerals that lie near the surface. Waste, or overburden is first removed and the mineral is broken and loaded.

### Ore

Rock that contains sufficient quantities of metals or other minerals to allow profitable extraction.

### Pit

A large hole created when ore and waste rock is removed from the ground.

### PCBs

This is an oily-like substance that was brought to the sites as a coolant used in electrical equipment. PCBs were also mixed with paint to be used as a moisture barrier. If

these products are not disposed of properly, they can cause contamination of soils, air and water and cause bioaccumulation in mammals.

### Reclamation

The process of converting disturbed land to its former or other productive uses.

### Remediation

The removal, reduction or neutralization of substances, wastes or hazardous material from a site to prevent or minimize adverse effects on the environment or public safety.

### Serpentinite

A rock consisting almost completely of magnesium, iron and silicate hydroxide. Asbestos is found in serpentinite rock and was used for numerous industrial functions.

### Tailings

Rejected material from mining and screening operations is known as tailings. The waste material left after the metals have been removed from the ore by the milling process.

### Type II Mine Sites

The Yukon has seven mine sites which were identified at the time of devolution as having the potential for unfunded environmental liabilities if abandoned without proper closure. They are referred to as Type II Mines under the DTA, which provides key principles for management of these sites.

### Waste Rock

Rock of little economic value that must be removed to access the ore is called "waste rock".





**For more information on the Type II mine sites please contact:**

Government of Canada  
Type II Mines Office  
Indian and Northern Affairs Canada  
415C – 300 Main Street  
Whitehorse, Yukon  
Y1A 2B5

Ph: (867) 667-3888  
[ytinfo@inac.gc.ca](mailto:ytinfo@inac.gc.ca)



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