

# Kinross True North Mine Reclamation

The Northern Latitudes Mining Reclamation Workshop addresses reclamation, remediation, and other aspects associated with the unique climate and ecosystems of northern locations as we reclaim the north. As we look at mining operations, we consider not only statutes and regulations, but also the unique conditions of the individual mine sites to determine the success of reclamation activities. Where possible, the State looks to encourage reclamation practices with the nomination for reclamation awards for those companies and individuals that exceed the minimum standards. One such award is the Interstate Mining Compact Commission (IMCC) National Reclamation Award. The State of Alaska nominated Kinross True North Mine for the State's first entry for the IMCC reclamation award. The State's nomination considered the eligibility requirement of the IMCC for active reclamation work done on the site within the 12-month period prior to the nomination as well as compliance with 11 AAC 97.200, Reclamation Performance Standards. In this respect, we reviewed the stability of the disturbed surface and the reestablishment of vegetation in accordance with the proposed secondary land use of wildlife habitat as the metric for success.

## Location – Description:



The True North Gold Mine is within the Chatanika River watershed approximately 26 miles northwest of Fairbanks Alaska. The Millsite Lease, ADL 416509, enclosing the ore deposit and ancillary facilities, includes 2,100 acres (3.28 square miles) located entirely on State and University of Alaska land within portions of Sections 21, 27, 28, 29, 32, & 33, Township 3N, Range 1E, Fairbanks meridian. There is no federal land involved within the project boundaries and the closest residence is approximately one mile from the project boundary.

Figure 1: Project Location

The site is located along a ridgeline that trends north with relatively steep slopes to the east and west.

The crest of the ridgeline slopes gently to the north. The area is heavily vegetated with Black Spruce and surface moss covering the north and east facing slopes. The top of the ridgeline has south facing slopes vegetated with birch trees and is generally free of permafrost.



Figure 2: True North Mine Site Disturbance as of 2003

The True North deposit is located within the Yukon-Tanana terrane, which is bounded on the northeast by the Tintina fault and on the southwest by the Denali fault. The center of the ore body is located on the northwest flank of Pedro Dome on the ridge between Dome Creek and Eldorado Creeks at elevations ranging between 1,760 to 1,200 feet.

The climatic conditions of the Fairbanks area are consistent with interior Alaskan subarctic conditions,

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of short warm summers and long cold winters. Diurnal temperature fluctuations can be very large and are driven by the vast change of sunlight occurring throughout the year. Due to climatic conditions, reclamation typically occurs during the summer months from June through August.

## *Compliance:*

On average, the State inspects the site twice a year; after the spring freshet and before the winter. During mining operations, additional inspections occurred. At this time, water quality monitoring associated with the Alaska Department of Environmental Conservation (ADEC) Waste Management Permit has been completed and with the permit conditions fulfilled, that permit has been retired. The main permits remaining are the ADEC Storm Water Pollution Prevention Plan and the Alaska Department of Natural Resources (ADNR) Reclamation Plan Approval. The site appears to be in substantial compliance with these permits with no outstanding permit violations. Kinross has worked with the State to ensure that the site will meet the objectives for the reclamation plan; to return the land disturbed by mining operations to a stabilized and near-natural environment, ensure long-term protection of land and water resources, minimize or eliminate long-term management requirements while meeting state and federal regulatory requirements.

An Environmental Compliance and Management Systems Audit was completed May 2012 with this information used for consideration in the revised True North Reclamation and Closure Plan that was approved in July 2012. The State requires the Reclamation and Closure Plan resubmitted every five years. This plan proposed an estimate for Financial Assurance in the amount of \$3,066,526 which was approved and provided through a letter of credit. The majority of the reclamation was completed during the summer and fall of 2013. The State has approved partial financial release of \$2,446,190 for the reclamation work that has been complete to date with \$620,336 remaining for financial assurance.

## *Contemporaneous Reclamation:*

The True North ore body is approximately 10 road miles from the Fort Knox Gold Mine. To mitigate long term water management issues, True North was designed and permitted to haul the gold bearing ore to the 72,000 tons per day Fort Knox Gold Mine gyratory crusher. The ore was processed through a gravity recovery and carbon-in-pulp circuit.



Figure 3: North Shepard Waste Rock Dump - 2005

The True North Mine commenced operation at the end of January 2001 with the first blast occurring on February 9, 2001. Routine hauling of ore to the Fort Knox Primary Crusher began on April 13, 2001. A total of 36.4 million tons of material were mined between January 2001 and December 2004.

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Figure 4: North Shepard Waste Rock Dump - 2013

In 2004, undecided if mining activities would continue the following year, Kinross identified 125 acres that would not be subject to further disturbance if mining activities resumed. During the summer of 2005, that identified disturbance was regraded, ripped, seeded and fertilized. This work included the North Shepard Dump, Hindenburg Dump, Zeppelin Dump, and South Shepard

Dump. The area was regraded with D10 dozers and ripped with a D8 dozer. Seed and fertilizer was applied on all reclaimed disturbance using either a broadcaster mounted on a D4 dozer or by aerial application using a fixed wing aircraft. Reclamation consisted of scarifying or ripping of the graded surface on contours that were 18" deep and spaced 18 to 24 inches apart that created a broken, roughened surface to trap moisture, reduce wind shear, and minimize surface erosion by increasing infiltration of the top surface of the soil, which in turn, created micro-habitats conducive to seed germination and development. The seed application rate and mixture was developed in collaboration with the Alaska Department of Natural Resources Division of Agriculture, Alaska Plant Material Center based on seed availability and test plots.

Thirteen separate waste rock dumps accounted for approximately 350 acres disturbance. In 2009, the



Figure 5: Louis Dump - 2005



Figure 6: Louis Dump - 2013

State was notified that the company decided to cease mining operations and reclaim the True North mine site. During that year, reclamation was performed on approximately 202 acres of dumps. Louis dump was a major part of this effort encompassing 110 Acres.

## *Drainage:*

The interior of Alaska is considered to be a semi-arid desert region located in the arctic. Discontinuous zones of permafrost are present at the site. Permafrost, or perennially frozen ground, is defined as soil or rock having temperatures below 0°C over a least two consecutive winters and the intervening summer. Moisture in the form of water or ice may not be present.

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In these discontinuous zones permafrost occurs in scattered islands ranging in size from a few square feet to acres while the depth penetrated ten to thirty feet below the peat or moss cover into the basement bedrock. This was primarily the overburden from the Hindenburg Pit and the foundation of the Hindenburg and Zeppelin Waste Rock Dump.



Subsequent to the 2005 reclamation work, a portion of the North Shepard Dump slumped in 2007 requiring additional earthwork and reseeding/fertilizing. Survey prisms were installed and the movement of the slump was monitored by tracking the survey points. The slump area encompassed approximately 7 acres. In 2010 the slump was deemed stable enough to be regraded, scarified and revegetated. The mitigation process included excavating slumped soil mass and hauling the material to Central Pit located below and backfilling along the south and west edge of the pit. The backfill material was then pushed to the south and east at a 3:1 slope for final grading. The overburden mass was excavated to a 2.5:1 or shallower slope or until undisturbed ground was encountered.

Figure 7: Central and Hindenburg Pits - 2005

Of note is the reclamation that has occurred in the pits. The State does not require reclamation of the pit; however, the pit walls do need to be in stable condition. The Central Pit was partially backfilled in 2007 to reduce surface water pooling. The Hindenburg Pit floor was graded and scarified to reduce potential runoff to the North Central Pit which enabled revegetation and a reduction in surface water flow. A diversion ditch along the southeast rim of the Central Pit and Hindenburg Pit was constructed in 2007 to divert surface storm water away from the pits.



Figure 8: Central and Hindenburg Pits - 2013

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Due to continued reclamation work within and around the pits and to address water flow, the Central Pit and Hindenburg Pit were regraded and scarified once again in August 2010. The Shepard Pit was reclaimed in July 2010, and again in 2013; the pit floor was scarified, seeded and fertilized. The diversion ditch above the pit was cleaned out and reconstructed to divert water away from the pits and toward the Shepard Road. The Central and Hindenburg pits received seed and fertilizer in the years 2010-2014 to promote revegetation to encourage infiltration and reduce the velocity of surface water flow. All this effort has effectively eliminated the water issues occurring in the pits.

Interceptor dips work for the US Forest Service to manage water. Interceptor dips were installed on slopes and have successively worked on the mine site. During the 2014 season, this region experienced record rainfall events on three separate occasions; there was minimal water erosion due to the interceptor dips.

### *Post-Mining Land Use:*

The main objectives of the reclamation plan are to return the land disturbed by mining operations to a stabilized and near-natural environment, ensure long-term protection of land and water resources, minimize or eliminate long-term management requirements in order to encourage the traditional use of the land to residents, both human and animal.

True North provides a habitat to a large variety of Alaskan species. Moose, wolves, bear, sandhill cranes, and birds of prey have all been found at True North. Moose and wolves are found throughout most of Alaska. Moose typically live near timberline plateaus, along major rivers, and in recently burned areas. The creeks and wooded areas that are present at True North provide the dense willow strands, aspen, and birch shrubs that moose tend to enjoy. The topography at True North also offers a large, open area that wolves can utilize for hunting and roaming. Sandhill cranes and various birds of prey also enjoy the habitat that True North provides. The reclamation of the True North pit has left open cliffs. The cliffs are secluded and hard to reach so they offer a perfect location for birds to use for nesting. The creeks that are present also provide marshy, boggy areas with shallow water in which sandhill cranes enjoy nesting, feeding and rearing their young. The same pair of sandhill cranes, which mate for life, have been observed on the site since 2010. The mine site area is not short on fox. A reclamation practice was to leave larger boulders in place for visual diversification and habitat that would encourage picas and voles to inhabit as food for foxes. The picas also enjoyed some of the alder and birch seedlings that were planted at Louis Waste Rock Dump.



Figure 9: Moose Browse - 2014

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A total of 25,150 feet of trails have been installed. From the permit phase through the closure phase, Kinross committed to providing trails through the reclaimed True North site. Understanding the local community desire for traditional land use, the company worked and continues to work with trail user groups and ADNR Easements Section to accommodate trail uses through the minesite lease boundary. There is a well-developed trail system in this area that connects the surrounding communities, and is used by skiers, cyclists, walkers, running groups, snowmachiners, four-wheelers, and occasionally by equestrians. It is maintained primarily by the organized user groups. The 25,150 feet of trails enhances the connectivity of the trail system. The ADNR, Easements Section and the company worked together to determine the most effective route and installation criteria. In the summer of 2014, the State drove and walked the installed trail system and provided final approval and acceptance of the trail system.

As part of preserving the history of the surrounding areas and prior to the start of mining, Kinross FGMI produced a brochure of the history of the Davidson Ditch. An excerpt from the report:

*“The mining history of Fairbanks continues today. Fairbanks Gold Mining Company (FGMI) is continuing the development of the True North Mine north of Fairbanks. The mine area includes a segment of the Davidson Ditch. FGMI has already contracted for detailed historic documentation of the individual ditch structures within the impact area of the mine (Williams et al. 2002). This report was contracted by FGMI to preserve the general history of the ditch. The report reflects the content agreed to by FGMI and the Alaska State Historic Preservation Officer (SHPO) in a Memorandum of Agreement signed in 2002. Although various road and mine developments have impacted localized sections of the ditch, the remains of the Davidson Ditch are still present today. Several long sections have been surveyed in detail by archaeologists, and there are “Davidson Ditch” historic marker signs near Steese Milepost 57 (U.S. Creek) and Steese Milepost 68 (Sourdough Creek), although the Bureau of Land Management (BLM) interpretive panels at U.S. Creek are currently missing. This report summarizes the historic context and construction of the Davidson Ditch and provides descriptions of its design and use. In addition to historic information, summary data on the current state of features within surveyed portions are provided.”*

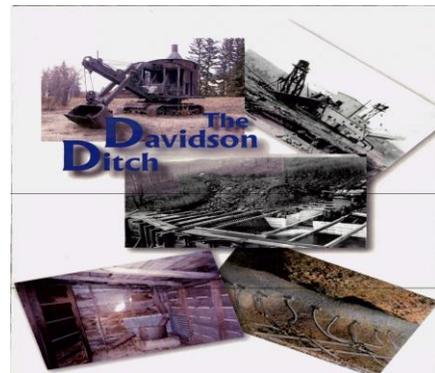


Figure 10: Cover for the Davidson Ditch Brochure

### Innovative Practices:

While using standard mechanical methods of reclamation, the broadcaster or hopper that was attached to the back of the D4 would often quit working due to the slope of the terrain. The oil in the hopper would drain away from the reservoir and set off the low level alarm and automatically turn off. The fertilizer application rate of 300 lbs per acre equated to 18.75 tons. The mine contacted a local pilot that had the ability to broadcast the remaining approved seed and fertilizer mixture with a fixed wing aircraft which required a relatively flat runway. After the runway was reclaimed, the mine hired a local rotary aircraft to complete the



Figure 11: Aerial Seeding via Fixed Wing Aircraft

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Figure 12: Aerial Seeding using Rotary Aircraft

seeding and fertilizing operation through the end of 2014. The reclamation aerial broadcasting campaign was completed in 2014.

The Alaska Department of Natural Resources does not require planting of trees; however, the operator looked for ways to help nature out a bit. Louis Dump was a primary candidate to plant some trees. It is also the first visible feature of the reclaimed mine site from the access road.

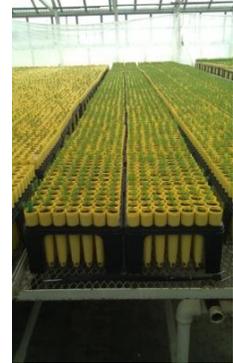


Figure 13: Seedlings for the True North Mine Site

In 2010, Kinross set out to utilize indigenous seedlings. After determining that no seedlings were available locally, the company approached a greenhouse in the community to see if indigenous seedlings could be grown. The Greenhouse contacted University of Alaska Fairbanks and partnered with an arborist to develop a plan for harvesting and germinating local seeds. The chosen species were Black Spruce, White Spruce, Birch, and Alder. The seeds were gathered between October 2011 and February 2012. In March, the germinated seeds were sown in 10 cubic inch tubes with growth medium consisting of 30-40% peat, 10-20% coco fibers, and 50% vermiculite.

With the substantial compliance to permit conditions, working with nature to return the mining-disturbed land back to a stable natural form suitable for human and wildlife use, Kinross has looked for innovative methods for revegetating the site both aerially and on the ground and successfully incorporated community involvement for trail development.

As one of 23 member states of the IMCC, the State of Alaska selected Kinross True North Mine for the 2015 Kenes C. Bowling National Mine Reclamation Awards nomination. Honorable Mention may be awarded at the discretion of the Awards Committee for a particular site that stands out and deserves special recognition when not selected as that year's category winner. We congratulate Kinross True North Mine on their exemplary reclamation of the mine site that addressed discontinuous permafrost conditions, site drainage that handled the flow of three 100-year storm events within one summer, community involvement, and rehabilitated the site for wildlife habitat that earned an Honorable mention from the IMCC.

Many thanks go to Kinross and their employee, Jennifer Pyecha, for the photos and information.



Figure 14: Kinross True North Mine Site 2013

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