

# **CLOSURE OF THE COLOMAC MINE – A FIRST NATIONS – MINE OWNER COLLABORATION**

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## **ABSTRACT**

The reclamation of mines is an important issue for Aboriginal peoples in Canada who have mines in their traditional territories. Mine owners and operators have a responsibility to engage those First Nation communities affected by these projects in decisions relating to land use and environment including, particularly, mine site reclamation and closure. Decisions must be made that consider legal and policy requirements, scientific and technical standards and practices, traditional knowledge and cultural values. Closure planning for the abandoned Colomac gold mine in the Northwest Territory represents a successful collaborative planning and decision-making process that evolved from a partnership between the Tlicho First Nation (formerly known as the Dogrib Treaty 11 Council) and the federal Department of Indian Affairs and Northern Development (DIAND) as owner of the site.

DIAND and the Tlicho pioneered a joint working relationship to research potential options for closure, and to establish a means whereby each partner was able to use its values and priorities to systematically assess project risks and to ultimately select a preferred closure option. Although the process encountered many challenges, the mine closure plan resulting from the process ultimately met the needs of both partners. The key ingredients for success included early and meaningful involvement of the Tlicho communities in the closure planning, and the provision of resources to enable them to do so.

## **INTRODUCTION**

The current activities underway at the Colomac gold mine in northern Canada present a successful example of a joint mine closure process undertaken by the mine owner and the affected First Nation communities. In this case the owner, the Department of Indian Affairs and Northern Development, undertook, along with the federal Department of Public Works, a collaborative long-term program of field research, site management, and closure planning involving representatives of the Tlicho Governments as active partners.

The partnership was initiated in 2000 shortly after the Crown assumed legal responsibilities for the site, placed into receivership by the former owner, Royal Oak Mines. The parties subsequently developed a closure plan that was approved by the Mackenzie Valley Land and Water Board 2004. The experience has produced a number of good lessons for future such partnerships between a mine owner and affected First Nations where effective and locally-supported site reclamation of a mine in Aboriginal territory is the goal.

## BACKGROUND

### Importance of the Area

Colomac is a shutdown gold mine located in the headwaters of the Indin River system approximately 40 km west of the Tlicho community of Wekweti and 220 km north of Yellowknife.

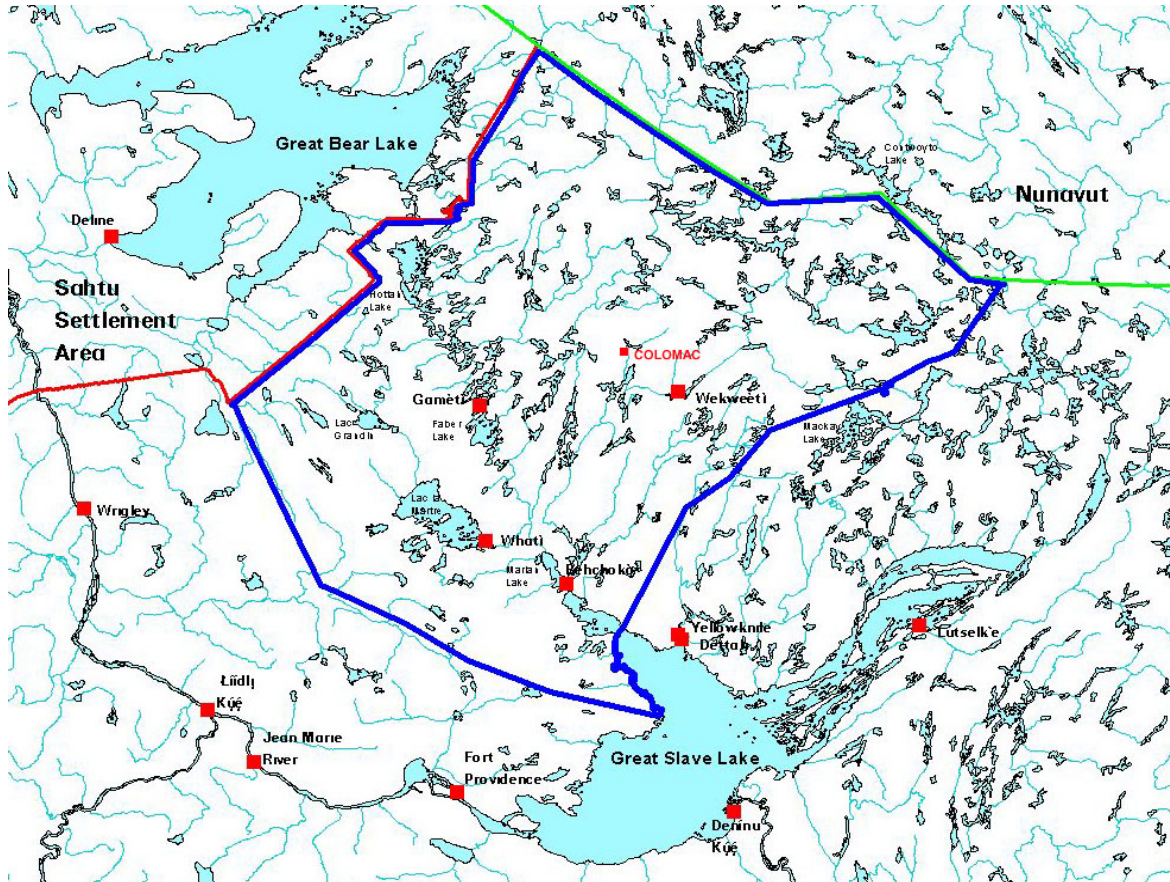


Figure 1. Colomac Location Map showing an outline of the Wek'eezhii region of the Tlicho People.

The mine lies in a region known as Wek'eezhii (outlined area in the above figure), part of the traditional lands of the Tlicho people, and now formally recognized in the 2005 Tlicho treaty with Canada. It includes the normal winter range of the Bathurst caribou herd, traditionally and today an economic mainstay of the Tlicho. The caribou move into this area in late fall, and linger until early spring when they start moving north again. During the early winter many Tlicho people travel into this area to harvest caribou.

### Site History

DIAND inherited the Colomac site after Royal Oak Mines declared insolvency in 1999, and thus became legally responsible for the decommissioning and reclamation of the site.

Left at the site were three open pits, beached tailings and contaminated tailings water in a tailings impoundment originally licensed as a 'no discharge' facility, several waste rock dumps, and other assorted usual mine infrastructure such as the mill, accommodation buildings, fuel tanks, roads and airstrip.

Of immediate environmental concern at the time of mine shutdown in 1997 was the presence of tailings water contaminated by the cyanide processing of the gold ore, along with the rising levels of this water due to natural inflows into the tailings impoundment. Modeling then showed that the tailings pond might overflow as early as 2005. More recent predictions are for the safe discharge of tailings water into the Indin River system by 2008.

During this period, natural breakdown of cyanide products, along with some enhanced breakdown through the addition of phosphate, has resulted in greatly improved water quality, with ammonia being the only possible contaminant of concern by the time discharge occurs.

## **THE ORGANIZATION**

From the start DIAND actively sought the full engagement of the Tlicho as an equal partner in the planning process. Funding was provided by the department to enable the Tlicho to participate in site studies, community consultation, and planning and management activities necessary for the development of the closure plan.

The Tlicho engagement included:

- a. membership on a project management committee;
- b. membership on a scientific team established to support the work; and,
- c. engagement of a Tlicho-owned company for management of the site during the reclamation period. An executive committee was also set up with comprised DIAND officials and the Tlicho leadership to deal with key policy issues arising from the planning work.

A full-time Colomac community advisor was hired, along with a part-time technical consultant. These people participated as members of the various project teams established for the project.

The most central of these was the joint Colomac Project Management Team set up to oversee the closure planning for the Colomac site. During the planning phase, this committee met every second week in order to discuss site issues, options for dealing with these issues, and to develop the closure plan.

## **THE PROCESS**

The joint process involved the Tlicho in a number of distinct ways, including field research, community communication, site maintenance, site assessment and closure planning.

## Field Studies

One of the first activities in the closure planning was the compilation of available traditional knowledge about the site. DIAND funded a Tlicho program of research which comprised a series of interviews with knowledgeable land users in each of the communities.

The community advisor conducted surveys in each community to identify the Tlicho economic and cultural uses of the area, and the Tlicho valued ecosystem components at the site. This information was then used in three ways:

- to supplement the earlier environmental baseline studies for closure planning and setting of closure objectives;
- to ensure that closure planning would account for Tlicho knowledge and use of the site; and,
- to identify for an ecological and human health risk assessment potential contaminant pathways to humans through plants and animals that might be exposed to contaminants through drinking water, eating plants, or licking mineral deposits on the surface of dried tailings.

As a result of this work, additional field investigations were conducted over a couple of years to acquire an understanding of actual contamination by the mine of resident plants and wildlife communities at the site. The surveys were conducted using Tlicho field workers in the sampling programs, which included tissue sampling of soil, plants, birds, small mammals, fish, and large mammals (particularly caribou).

## Community Consultation

During the closure planning from 2000 to 2004, DIAND both provided funding and participated in an annual round of community meetings. The purpose of these was to keep the four Tlicho communities up to speed on what was happening at the site, and to ensure that developing closure plans remained consistent with Tlicho objectives and addressed Tlicho concerns. Having the Tlicho community advisor as part of the project team, and the Tlicho technical consultant available to comment on the scientific issues, greatly facilitated these meetings. DIAND also took several initiatives during this time to prepare information materials, including two video productions, on the closure issues and plans, which were distributed in the communities.

## Site Assessment

In preparing for the development of the closure plan, several years of technical investigations and inventory work were required at the site. This was conducted by both the on-site Tlicho site management team and the joint Colomac scientific team.

## **JOINT CLOSURE PLANNING**

### Tlicho Goals

An important point in this story is that DIAND actively sought early clarification from the Tlicho First Nation about what options would be acceptable to them in terms of site closure.

At the first public hearing held by the Northwest Territories Water Board when DIAND was applying for its water licence as the new site owner, the Tlicho set out several criteria that would be key for them:

- there could be no authorized use of water which would negatively affect the quality or quantity of water flowing onto Tlicho lands;
- the water licence should ensure protection of the environment in both the short and long-term;
- no risk or minimal risk to water in the Indin River system;
- no risk to Tlicho land users; and,
- there must be a high degree of certainty for a successful closure.

The Tlicho were also clear that socio-economic factors, cost, and length of time to complete the closure were of lesser importance to them than the prime goal of environmental protection.

As the closure planning continued over the next few years, these and similar criteria were consistently expressed in the various rounds of community meetings held by the joint project team, and were ultimately applied by the Tlicho in selecting their preferred options for closure.

### Framing the Exercise

To serve as the basis for developing a closure plan, a subcommittee of the project management team prepared an initial comprehensive review of the closure needs for the Colomac site. This paper, for each mine component to be reclaimed, described:

- its current condition;
- the existing or potential environmental, technical, compliance, and cost issues;
- a set of proposed objectives for closure; and,
- potential options available to meet the objectives.

For most components, several options were identified, including a ‘do nothing’ option to illustrate the consequences of not implementing a closure program. An example is shown below which summarizes these options for the open pit component.

<b>Table 1: Example - Open Pit Closure Options</b>		
<i>Goal</i>	<i>Objective</i>	<i>Options</i>
Eliminate health, safety & environmental risk assoc'd with pit	Block access to pits for humans and large mammals	<ol style="list-style-type: none"> <li>1. Construct fence around pits; block ramp</li> <li>2. backfill pits with waste rock</li> <li>3. repair rock berms around pit rim</li> <li>4. recontour pit rims</li> <li>5. do nothing</li> </ol>

### Evaluation Framework

The project management team developed a framework to be used by the partners in selecting the preferred closure options. The evaluation was conducted separately by a Tlicho team (Grand Chief, four community chiefs, 4 elders) and a DIAND team, allowing each to evaluate closure options according to their own priorities. Results were compared at the end of the evaluation.

This framework provided both teams with a 3-tiered approach to evaluating the significant environmental, technical, socio-economic and financial criteria for each option.

Tier 1 constituted a filter for mandatory requirements - things the option had to achieve in order to be further considered (i.e., advance to Tier 2). Tier 1 criteria included:

- legal compliance;
- option must be executable in sufficient time to prevent any significant adverse impacts;
- option must have been proven to work successfully at other sites. It could not be a new approach which has not been tried elsewhere; and,
- compliance with the environmental requirements of the Tlicho and of DIAND (as defined by them).

Tier 2 provided a subjective rating of the options according to environmental, technical, and political criteria. These criteria were weighted, based on their deemed importance to the final decision. The rating used a ‘high-medium-low’ scheme for the Tlicho team, and a ‘9-3-1’ scheme for the DIAND team.

Tier 2 criteria included things such as:

- technical certainty (technology chosen should be known to work in northern environments. (options with easily available materials and skills and low complexity rated higher);
- option meets or surpasses closure objectives;
- The option will maintain its effectiveness over time (this may include periodic inspection and care and maintenance activities);
- reduction of ecological risk to water, fish and wildlife;

- technical expediency (short implementation time = high score);
- regulatory expediency (implementation time should be consistent with any time constraints required for obtaining regulatory approvals);
- compliance with government environmental guidelines & standards;
- minimize risk to health and safety during implementation, operation and at the completion of the project (low risk = high score... factors considered included toxicological risks to workers and safety to workers and public on site);
- maximize future land use opportunities (variety of potential land uses = high score);
- eliminate or minimize site liability (factors considered were the need for perpetual maintenance, risk of system failure, and the absence of residual impacts);
- Tlicho environmental preference;
- Tlicho economic opportunities;
- DIAND environmental preference;
- DIAND corporate objectives; and,
- public issues (environmental protection; use of the site; economic benefits).

Tier 3 evaluated costs of the options. The assessment compared predicted capital and operating costs, magnitude and timeframe of any monitoring costs over time and the 'regularity' of cost disbursements over time.

The Tier 3 score was added to the Tier 2 score to determine the highest ranked option. Interestingly, cost comparisons did not change the result from the Tier 2 evaluation.

Weighting factors for Tier 2 and Tier 3 criteria were also used to indicate the relative importance of each criterion in the evaluation. The weighting produced the following balance between the 4 spheres of evaluation:

- Environmental factors – 28%
- Technical factors – 25%
- Political factors – 24%
- Cost factors - 24%

## **TLICHO EVALUATION PROCESS**

After several preliminary planning meetings, the Tlicho team, along with the Tlicho community and technical advisors, locked themselves in a room for three days to work through the option selection process.

The first step in this exercise was to review the issues associated with each mine component. Then the available options for addressing each issue associated with each mine component were examined. Technical advisors and consultants from DIAND's team were present for this discussion, particularly when dealing with options for tailings and tailings water management which presented several technical challenges for the planning team.

The option selection process was divided into three components: land issues; water issues; and tailings, the last being the most complex. Several years of water quality monitoring, treatment investigations, and other site studies had been needed to fully understand what trends in water quality were occurring, and precisely how long it would take until the impoundment and pit would have to discharge water. Additionally, the main tailings dam was leaking contaminated water into the downstream environment, and this would have to be fixed as early as possible.

The Tlichos evaluation team, therefore, needed to understand and discuss options for dealing with all aspects of the property, including complex issues associated with the leaking dam, how to extend the time before having to discharge water from the pond and the pit in order to achieve the best water quality, and what to do with beached tailings. All technically achievable options were on the table including, for example, relocating all the tailings to an open pit for permanent storage (although this was not ultimately selected).

The Tlichos selected the criteria that were the most important to them for each option. The following table, ranking the tailings closure options according to whether they are predicted to do a ‘good’ job (High), an ‘acceptable’ job (Medium), or a ‘poor’ job (Low), illustrates the results for six options considered.

<b>Table 2. Example - Tlichos Tailings Option Evaluations</b>						
	Move tailings		Cover tailings			
	<b>Option 1</b>	<b>Option 2</b>	<b>Option 3</b>	<b>Option 4</b>	<b>Option 5</b>	<b>Option 6</b>
<b>Tlichos Goals</b>	S. Lk tailings to T. Lk	All tailings to Z2 pit	Wet rock cover	Dry cover (rock/soil)	Plant, no cover	Flood T. Lk
Safety to people & wildlife	Med	High	Med	Med	Low	Med
No dust	High	High	High	High	Low	High
No new sites disturbed	High	High	High	High (if no esker used)	High	Med
Walk-away, effective	High	High	Med (water balance may not keep cover wet)	High	Low	Low
Restores natural Conditions	Med	High	Low	Med	Med	Med
Gets rid of contaminated sites	Low	Med-high (moves some contamination to Z2 pit)	Low	Low	Low	Low

Other factors (e.g., cost, proven technology, health & safety risks) were also used to evaluate the options.

The last step was to decide on a ‘preferred’ Tlichos option (in the tailings case, for instance, a dry cover was selected). Choices for the remaining options were ‘acceptable’ (could be acceptable under certain conditions) or ‘non-acceptable’. This exercise involved much discussion between the elders and the chiefs as to appropriate choice. This is an example of how traditional knowledge was being used implicitly to inform the discussion.

At the end of the process, the ‘preferred’ option in each case represented the package of measures that the Tlichos wanted incorporated into the closure plan.



After the Tlicho selection process was completed, the results were compared to DIAND’s choices, and there was joint meeting to resolve the few differences that emerged.

## CONCLUSIONS & LESSONS LEARNED

1. The Colomac reclamation project has been very positive from the perspective of both parties. The 5-year process produced a technically and environmentally sound, and affordable, plan that met the approval of the regulator, the government (as licensee), and the Tlicho as the most potentially affected party.

The project is an outstanding example of effective collaboration between a site operator and an affected First Nation. Because of [a] the deep engagement from the outset; and [b] the real attempt to address the needs of the Tlicho in reclamation of the site, the process goes far beyond any conventional definition of ‘consultation’. It sets a new benchmark for enabling a First Nation to participate meaningfully in a land use planning exercise that ultimately affects how its people use the land and resources of its traditional territory. The fact that the Tlicho were visibly involved in the reclamation project from the start won support for the closure plan in the Tlicho communities.

2. The effective involvement of the Tlicho required the provision of financial resources from the mine owner, and the commitment to an open and full sharing of all technical information relating to the site.
3. The close correlation in the selected closure options of the parties means that each benefited by getting the measures adopted that they wanted (see Table 3). Close work throughout the process meant that little compromise was required at the end to get agreement on closure options.

<b>Table 3. Example - Comparing the Results.</b>						
<b>(N = not acceptable; A = acceptable; P = preferred)</b>						
	Move tailings		Cover tailings			
	S. Lk tailings to T. Lk	All tailings to Z2 pit	Wet rock cover	Dry cover (rock/soil)	Plant, no cover	Flood T. Lk
Tlicho selection	N	N	A	P	N	N
DIAND selection	N	N	A	P (Spruce Lk)	A	P (T. Lk) Note: scored higher only by 1% than dry cover option

4. One of the learned benefits of having the Tlicho as active partners in the project was the ability of the mine owner to gain timely regulatory approvals.

An example of this came early in the project when the site water quality monitoring indicated that the natural breakdown of cyanide products in the tailings and pit water could be enhanced with the addition of mono-ammonium phosphate. Since the Tlicho technical advisor had participated in monitoring the water quality assessment program, it was easy to make a recommendation to the Tlicho leadership that the phosphate addition should be supported.

5. The joint process also meant that the Tlicho could advance issues that were particularly important to them, and get them considered in a timely fashion. One of these was the perceived need to fence the beached tailings during the interim period to final cover placement. The reason is to prevent caribou from consuming tailings during the winter, which they were observed doing during the winter of 2003-04. The fence has since been built and will be maintained until a permanent waste rock cover is in place.