CASE STUDIES AND DECISION MAKING PROCESS FOR
THE RELINQUISHMENT OF CLOSED MINE SITES

Prepared for:

NATIONAL ORPHANED/ABANDONED MINES INITIATIVE

By

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# CASE STUDIES AND DECISION MAKING PROCESS FOR THE RELINQUISHMENT OF CLOSED MINE SITES

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DISCLAIMER

This report was prepared to provide case studies and a decision making process for the relinquishment of closed mine sites. The authors assume no responsibility for actions taken by others on the basis of knowledge acquired from reviewing the material herein.

The National Orphaned/Abandoned Mines Initiative (NOAMI) Advisory Committee makes no warrantee of any kind with respect to the content and accepts no liability arising from the use of this report.

Backdrop photo is of the Farley (foreground) and "A" Shaft sites, Lynn Lake, courtesy of Department of Industry and Commerce, Province of Manitoba.
INTRODUCTION
Once the commercial aspects of a mine are diminished and the site is closed out, the proponent may ultimately wish to relinquish (give-up, surrender, abandon, return) the site to the Crown. The reality is: 1) the proponent may not wish to carry these properties on their books forever, especially a company based off-shore; and 2) ongoing liabilities are required to be reported in corporate financial reports. More importantly, 3) the proponent is ultimately going to disappear through a business closure or another process; and 4) the mineral rights leases or permits will expire. As a result the Crown must be prepared to receive the lands back either on their managed terms or through unplanned abandonment over time. Jurisdictions not wishing to receive such lands on terms other than those agreed upon must have the authority, policy and procedures in place as to how this will be done.

A “Guidance Document for Mine Closure and Management of Long-Term Liabilities: Examining the Policy Framework in Canada” was prepared for the National Orphaned/Abandoned Mines Initiative (NOAMI) by Cowan et al. (2010). This guidance document examined the main components related to mine closure and post-closure site management which can include long-term maintenance and monitoring liabilities. It considered long-term care, monitoring and maintenance of mines that may cease to operate and the options whereby mining jurisdictions may accept mining lands back to the Crown.

Subsequently a NOAMI Task Group identified the need to develop materials that would examine specific case studies and use the sum of information collected to establish a decision matrix (or tree) that would outline the key factors that need to be assessed in determining if a site should be brought under government jurisdiction or remain the responsibility of the operator. This report was created to complete the described study.

Case Studies
The project required that several case studies be completed on closed mine sites in Canada that are being returned, or have made application to be returned to the Crown under an established legal framework. The preparation of a preliminary list for discussion turned out to be a significant task as very few mine sites were found to be both available for study and suitable to contribute to the development of a decision tree or matrix. Ultimately the requirement for sites that are being returned, or have made application to be returned to the Crown under an established legal framework was revised and five sites were studied that illustrated relevant information and “lessons learned.” A sixth study was completed at the request of NOAMI when a major site in Manitoba was released from liability to the Crown in 2012.

Case studies were prepared for the following sites:

- Quebec Lithium Mine, Quebec
- Renabie Gold Mine, north-central Ontario
• Polaris base metals mine, Nunavut
• Gregg River Coal Mine, Alberta
• Contact Lake Gold Mine, northern Saskatchewan
• Farley East Tailings Management Area, northern Manitoba

From these six case studies a series of “lessons learned” was established and refined; these were subsequently used to develop a Five-Step decision making process as described below.

**Decision Making Process**
A Five-Step decision making process has been created following the natural progression from “Submitting the Application” through to “Implementation.” It requires that the jurisdiction has the legal authority or processes to accept mining lands requiring some form of long-term care.

**Step 1: Submitting the Application:** This requires that the proponent qualifies to apply for relinquishment; that the closure plan has been implemented; that closure and post-closure land use objectives have been or are being met; that other existing permits have been fulfilled or are transferable to the jurisdiction; and that notification of the application has or will be provided to necessary parties and potentially, impacted stakeholders, Aboriginal peoples, and others.

**Step 2: Site Assessment:** This step sets out the locational and technical issues that must be assessed to determine if the site is reclaimed to a state that meets the legal requirements under which the closure plan was developed and that it meets proposed future land use requirements. As well this information is required to establish future land use controls for the site, where needed. This step also examines whether any interim monitoring requirements exist; if so, the relinquishment process is curtailed until they are provided for evaluation. Projects meeting the requirements of this step proceed to the next step; if not, actions must be taken to produce acceptable conditions.

**Step 3: The Long-Term:** This step evaluates what needs there may be for long-term monitoring, maintenance or capital replacement of rehabilitation works and cost estimating for this work. This work ranges from routine activities such as water quality monitoring or fence inspections to estimated replacement schedules and costs for capital works such as shaft cap replacement or treatment plant components. It also requires a peer reviewed risk assessment by qualified persons for unforeseen events. For mines with very high funding requirements a proponent may find the costs for relinquishment prohibitive and elect to retain the properties. An appeal mechanism may be necessary.

**Step 4: Funding:** This step considers what future activities have to be funded, the costing for this and the method of fund management. The funds should be kept in special purpose accounts that contain funds dedicated to these mining related activities – they do not need to be managed in project specific accounts. All funds are provided by the proponent. Establishing the amount of funds a proponent may have to put up or provide access to can be very complicated. An element of fairness must be considered if such a
process is going to work; as with Step 3, an appeal process or dispute resolution process may be beneficial.

**Step 5: Implementation:** Once a relinquishment program is instituted the regulator must have a management system in place to ensure that the work gets done; to manage the funds; and to provide secure data management systems. An emergency protocol should be put in place as should a protocol for dealing with the public for a variety of circumstances, e.g. notification, volunteer work.

**Summary**

It is the view of the authors of this study that mining projects should be designed with the objective of reclaiming the site for relinquishment and future beneficial use. It is clear that relinquishment will not be possible where the environmental, social, political or financial risks/costs are too great. However, we believe that a well-designed and well-managed relinquishment policy and program can lead to a win/win situation in many instances. The Five-Step decision making process proposed herein should assist jurisdictions in developing policies and procedures for relinquishment that reflect the regulatory environment of the jurisdiction within the context of mining as an economic development instrument.
SOMMAIRE

INTRODUCTION
Lorsque les aspects commerciaux d’une mine sont réduits et que le site est fermé, le promoteur pourrait en fin de compte souhaiter céder (abandonner, remettre, redonner) le site à la Couronne. La réalité est la suivante : 1) le promoteur pourrait ne pas souhaiter porter ces propriétés à ses livres pour toujours, particulièrement dans le cas d’une entreprise située à l’étranger; 2) les obligations continues doivent être déclarées dans les rapports financiers de l’entreprise. Mais surtout, 3) le promoteur va finir par disparaître en fermant son entreprise ou par l’entremise d’un autre processus et 4) les locations ou les permis de droits miniers expireront. C’est pourquoi la Couronne doit se préparer à recevoir les sites miniers selon les modalités convenues ou par l’entremise d’un abandon imprévu au fil du temps. Les gouvernements qui ne souhaitent pas recevoir de tels sites selon des modalités autres que celles qui sont convenues doivent avoir le pouvoir nécessaire, ainsi qu’une politique et des procédures en place concernant la façon de faire.


Par la suite, le Groupe de travail sur l’INMOA a déterminé le besoin d’élaborer des documents qui porteraient sur des études de cas particulières et engloberaient l’information recueillie pour établir une matrice décisionnelle (ou un arbre décisionnel) qui soulignerait les principaux facteurs à prendre en considération pour déterminer si un site doit relever de la compétence du gouvernement ou s’il doit demeurer sous la responsabilité de l’exploitant. Ce rapport a été créé pour effectuer l’étude décrite.

Études de cas
Le projet exigeait la réalisation de plusieurs études de cas sur les sites miniers fermés au Canada qui sont retournés, ou qui ont fait l’objet d’une demande de retour, à la Couronne, conformément à un cadre juridique établi. La préparation d’une liste préliminaire aux fins de discussion s’est avérée une tâche importante, car très peu de sites miniers étaient à la fois disponibles pour l’étude et en mesure de contribuer à l’élaboration d’un arbre décisionnel ou d’une matrice décisionnelle. En fin de compte, l’exigence applicable aux sites qui sont retournés, ou qui ont fait l’objet d’une demande de retour, à la Couronne, conformément à un cadre juridique établi, a été revue et cinq sites ont fait l’objet de l’étude et ont fourni de l’information pertinente et des « lignes directrices ». Une sixième étude a été réalisée à la demande de l’INMOA lorsqu’un site majeur du Manitoba a été libéré de son obligation à l’égard de la Couronne en 2012.
Des études de cas ont été réalisées pour les sites suivants :

- la mine Québec Lithium, Québec;
- la mine d’or Renabie, centre nord de l’Ontario;
- la mine des métaux de base Polaris, Nunavut;
- la mine de charbon Gregg River, Alberta;
- la mine d’or Contact Lake, Nord de la Saskatchewan;
- la zone de gestion des résidus de Farley East, Nord du Manitoba.

À partir de ces six études de cas, on a établi et peaufiné une série de « lignes directrices »; elles ont ensuite servi à élaborer le processus décisionnel en cinq étapes décrit ci-dessous.

**Processus décisionnel**

Un processus décisionnel en cinq étapes a été créé en suivant la progression naturelle, à partir de la « présentation de la demande » jusqu’à la « mise en œuvre ». Il exige que le gouvernement ait le pouvoir juridique ou les procédés nécessaires pour accepter les sites miniers qui exigent une certaine forme de soins à long terme.

**Étape 1 : présentation de la demande** : Cette étape exige que le promoteur soit admissible pour présenter une demande de renonciation; que le plan de fermeture ait été mis en œuvre; que les objectifs de fermeture et d’utilisation des sites après la fermeture aient été atteints ou soient en voie de l’être; que d’autres permis existants aient été menés à terme ou soient transférables au gouvernement; que l’information concernant la demande ait été ou sera communiquée aux parties intéressées et, potentiellement, aux intervenants, aux peuples autochtones et autres concernés.

**Étape 2 : évaluation du site** : Cette étape établit les questions techniques et relatives à l’emplacement qui doivent être examinées pour déterminer si le site est réclamé dans un état qui respecte les exigences juridiques en vertu desquelles le plan de fermeture a été élaboré, et qui respecte les exigences relatives à la proposition d’utilisation future des sites. Cette information est également nécessaire pour établir les mesures de contrôle de la future utilisation du site, au besoin. Cette étape vise également à déterminer si des besoins du programme du suivi provisoire existent; le cas échéant, le processus de renonciation est suspendu jusqu’à ce que les besoins soient présentés aux fins d’évaluation. Les projets qui répondent aux exigences de cette étape passent à la prochaine étape; sinon, des mesures doivent être prises pour produire des conditions acceptables.

**Étape 3 : long terme** : Cette étape consiste à évaluer les besoins potentiels d’un suivi à long terme, d’entretien ou de remplacement des immobilisations des travaux de restauration et d’évaluation des coûts de ces travaux. Ces travaux englobent autant les activités de routine, comme le suivi de la qualité de l’eau ou les inspections des clôtures, que les calendriers estimatifs de remplacement et les coûts des travaux essentiels, comme le remplacement des capuchons des puits de mines ou les composantes d’usines de traitement. Elle exige également une évaluation des risques liés aux événements imprévus par des pairs qualifiés. Pour les mines ayant des besoins de financement très élevés, un
promoteur pourrait trouver que les coûts de la renonciation sont trop élevés et choisir de conserver les propriétés. Un mécanisme d’appel pourrait être nécessaire.

Étape 4 : financement : Cette étape consiste à déterminer les activités futures qui devront être financées, les coûts connexes et la méthode de gestion des fonds. Les fonds devraient être conservés dans des comptes à des fins déterminées qui contiennent des fonds destinés aux activités liées à la renonciation; ils n’ont pas besoin d’être gérés dans des comptes propres à certains projets. Tous les fonds sont fournis par le promoteur. L’établissement du montant des fonds qu’un promoteur pourrait fournir ou auxquels il pourrait fournir un accès peut être très compliqué. Un élément d’équité doit être pris en compte si l’on veut qu’un tel processus fonctionne; comme pour l’étape 3, un processus d’appel ou de règlement de différends pourrait être bénéfique.

Étape 5 : mise en œuvre : Une fois qu’un programme de renonciation est mis en œuvre, l’organisme de réglementation doit avoir un système de gestion en place pour s’assurer que le travail est effectué, gérer les fonds et fournir des systèmes sécurisés de gestion des données. Un protocole d’urgence devrait être mis en place, tout comme un protocole de relations avec le public dans diverses circonstances, par exemple, les avis et le bénévolat.

Résumé
Les auteurs de cette étude sont d’avis que les projets miniers devraient être conçus dans le but de remettre en état les sites aux fins de renonciation et d’utilisation bénéfique future. Il est évident que la renonciation ne sera pas possible dans les cas où les risques environnementaux/coûts, sociaux, politiques ou financiers seront trop élevés. Toutefois, nous croyons qu’une politique et un programme de renonciation bien conçus et bien gérés peuvent mener à une situation avantageuse pour toutes les parties dans de nombreux cas. Le processus décisionnel en cinq étapes proposé dans le présent document devrait aider les gouvernements à élaborer des politiques et des procédures de renonciation qui reflètent l’environnement réglementaire du gouvernement dans le contexte où l’exploitation minière constitue un instrument de développement économique.
CASE STUDIES AND DECISION MAKING PROCESS FOR RELINQUISHMENT OF CLOSED MINE SITES

INTRODUCTION
The National Orphaned and Abandoned Mines Initiative (NOAMI) has the role of assessing key abandoned mine issues and recommending to the Mines Ministers of Canada, actions, collaborative approaches and partnerships toward remediating existing abandoned mines and preventing/minimizing the accrual of further abandoned mines liabilities in Canada. When formed in 2002 NOAMI developed several guiding principles, one of which relates directly to this project: “Work toward eliminating future abandonment must continue, including the tightening of regulatory approaches.”

In 2009 Cowan Minerals Ltd. was contracted to prepare a report entitled “Guidance Document for Mine Closure and Management of Long-Term Liabilities: Examining the Policy Framework in Canada” (Cowan et al. 2010). This guidance document examined the main components related to mine closure and post-closure site management that can include long-term maintenance and monitoring liabilities. It considered long-term care, monitoring and maintenance of mines that may cease to operate and the options whereby mining jurisdictions may accept mining lands back to the Crown. A principal recommendation of this report was that “jurisdictions should have a managed relinquishment process that is clear and unfettered and is specific about what will not be accepted. Hitherto closure plans have been prepared on a “design for closure” basis. It is suggested that a more forward-looking approach be embraced and that a “design for relinquishment” approach be adopted”.

A follow-up NOAMI Workshop “Exploring the Management of Long-Term Liabilities and the Return of Mining Lands to the Crown in Canada” was held in 2011 (Tunis, 2011). A key recommendation of this workshop was that “NOAMI create a decision tree for return of lands to the Crown”. Subsequent to this workshop, a NOAMI Task Group identified the need to develop further materials that would examine specific case studies and use the sum of information collected to establish a decision matrix (or tree) that would outline the key factors that need to be assessed in determining if a site should be brought under government jurisdiction or remain the responsibility of the operator. To this end a Request for Proposals (RFP) was issued by NOAMI for a “study which would support them in developing a decision matrix or process that would allow jurisdictions to develop a policy framework and regulatory program for closure of mine sites and long-term management and related liabilities, in a manner that clearly sets out the responsibilities of the mine operator and government regulatory agencies” (from NOAMI RFP).

This report was prepared in response to the above-described RFP.
RELINQUISHMENT

Introduction
Once the commercial aspects of a mine are diminished and the site is closed out, the proponent may ultimately wish to relinquish (give-up, surrender, abandon, return) the site back to the Crown. The reality is: 1) the proponent may not wish to carry these properties on their books forever, especially if they are based off-shore; and 2) ongoing liabilities are required to be reported in corporate financial reports. More importantly, 3) the proponent is ultimately going to disappear through business closure or some other process; and 4) the mineral rights leases or permits will expire; i.e. the Crown must be prepared to either receive the lands back on their managed terms or through unplanned abandonment over time. It is therefore obvious that jurisdictions not wishing to receive such lands on terms other than those agreed upon must have the authority, policy and procedures in place as to how this will be done.

The Environment Issue Group of the Whitehorse Mining Initiative, 1994, p.19 recommended the following very eloquently:
“Governments should create a mechanism for the return of title of the closed-out mine sites to the Crown based on the following requirements:
a) the obligations of the reclamation plan, as noted under planning, have been completed;
b) it has been verified that the long-term obligations of the plan can be met on a continuing basis;
c) adequate funding has been provided to cover post-close-out monitoring and maintenance and, where necessary, long-term treatment; and
d) instruments such as risk-based financial assurance vehicles, * have been established to ensure that additional funds can be accessed if the company is not able to fund required work in excess of the site-specific financial assurance.”

*A footnote to item (d) above stated “A complete return of title and liability to the Crown would only be offered in cases where the level of risk can be reasonably determined. In such cases payments, based on insurance principles and related to the risk of each case, could be made to a fund. The provisions of a risk-based insurance fund would enable the Crown to meet any site-specific expenses after the return of the site.”

The role of tenure
The nature of the tenure for mining projects may vary from jurisdiction to jurisdiction. For instance in Ontario, when staked claims are taken to lease the claimholder, in most cases, may choose to take the mining rights only, or both the mining rights and the surface rights (assuming that they are available). In the former situation the proponent would then have to apply for the surface rights at a later date to secure those areas required for mining activities. The lessee or patentee of the mining rights is generally responsible for all mine hazards on, in or under the lands regardless of when and who created the hazards.
By contrast, in Saskatchewan, a mining claim taken to lease is for the mineral rights only. The proponent then has to negotiate a surface lease agreement to develop the mine. Following mining, a proponent (site holder) wishing to relinquish a closed site must satisfy the minister that they are eligible to receive a release from the surface lease agreements or any portion of them associated with the closed site. If the site holder owns the mineral rights associated with the closed site, the site holder surrenders or transfers those mineral rights to the minister at the time the minister accepts the closed site into the province’s Institutional Control Program.

Thus the route of the return or relinquishment of mining lands to the Crown will/may vary from jurisdiction to jurisdiction due to the nature of the tenure.

CASE STUDIES

Introduction
The project required that several case studies be completed on closed mine sites that are being returned, or have made application to be returned to the Crown under an established legal framework. Based upon guidance from the task group, the contractor was to review several closed mines from multiple Canadian jurisdictions; these would be vetted by the Task Group and a minimum of four were to be selected for development as case studies. Preparation of a preliminary list for discussion turned out to be a significant task for several reasons as follows:

- Few Canadian jurisdictions have an established legal and policy framework for post-closure management of mine sites;
- Those that do may or may not have sites in the process;
- Some jurisdictions did not participate perhaps reflecting the lack of an established process or the lack of suitable sites or both;
- Owners/regulators of some potential study sites were unwilling or unable to participate at this time for technical or management reasons (the contractor was dependent on both project owners and regulators to be willing participants if the necessary information was going to be made available).
- A general lack of knowledge of this topic in jurisdictions.

As a result very few mine sites were both available for study and suitable to contribute to the development of a decision tree. Ultimately the requirement for sites that are being returned, or have made application to be returned to the Crown under an established legal framework had to be revised and five sites were studied which illustrated relevant information and “lessons learned.” The sixth study was completed at the request of NOAMI when a major site in Manitoba was released from liability to the Crown in 2012.

Case studies were prepared for the following sites:

- Quebec Lithium Mine, Quebec
- Renabie Gold Mine, north-central Ontario
- Polaris Base Metals Mine, Nunavut
- Gregg River Coal Mine, Alberta
• Contact Lake Gold Mine, northern Saskatchewan
• Farley East Tailings Management Area, northern Manitoba

The locations of these sites are shown on Figure 1.

Information availability for these sites was exceptionally variable due to the age of the projects; changes in ownership, management and operational personnel; differing regulatory regimes and reporting requirements; variable corporate cultures; and variable accessibility to information. Where access to information or data required the use of Freedom of Information and Protection of Privacy Legislation this avenue was not pursued due to time constraints.

Figure 1: Location of 6 case study projects.
QUEBEC LITHIUM MINE, QUEBEC

Introduction
The Quebec Lithium Mine is located in Northwestern Quebec and serves as an example of a former producer that has been closed out and received a “Certificate of Release” under the Mining Act of Quebec. The site is now under new ownership with plans to create a lithium open pit mining operation.

Background
The Quebec Lithium site lies approximately 60 kilometres north of Val-d’Or and can be reached by Highway 397. The city of Amos is situated 38 kilometres northwest of the mine site. Figure 1 (above) shows the location.

The Quebec Lithium Mine is situated in the Precambrian Abitibi Greenstone belt of the Superior Province in the Canadian Shield. Several other lithium occurrences are nearby. The prospecting for and mining of base and precious metals has been an important part of the regional economy for close to 100 years.

Outdoor recreation is popular in the region. A ski hill and a number of cottages occur in the area.

According to Geological Survey of Canada Economic Geology Report No. 1, the Quebec Lithium mine is “an unzoned spodumene pegmatite. A belt 8,000 feet long and 2,000 feet wide contains numerous subparallel dykes as much as 2,000 feet long and 100 feet thick with moderate to steep dip. The dykes pass from amphibolitized greenstone at the surface into granodiorite at depth, and are remarkably homogeneous in grade and texture. Reserves in the shaft area alone have been estimated at 15 million tons of ore averaging more than 1.2 per cent Li₂O.” (Douglas, 1970)

Spodumene is a pyroxene mineral consisting of lithium aluminum inosilicate, LiAl(SiO₃)₂, and is considered the most important source of lithium. It may contain up to 8% Li₂O but typically ranges from 3 to 7% Li₂O. Spodumene concentrates generally range from 6 to 7% Li₂O for most mines. (From Lefond, 1975)

One of the main uses of lithium is for the production of lithium-ion batteries. Lithium metal is also used for lightweight alloys, lubricants, glass and ceramics.

Spodumene-bearing pegmatite was discovered at the site in 1942. This was followed by exploration programs of geological mapping, diamond drilling and bulk sampling by various companies over a period of several years. The property was acquired by Quebec Lithium Corp in 1954 and shaft sinking and mill development commenced in 1955. A three-compartment shaft was sunk to 560 feet (approximately 171 metres) with working levels established at 150, 275 and 400 feet (approximately 46, 83 and 121 metres). Three raises were driven to surface. The shaft was later slashed to a five-compartment shaft. (Stone and Selway, 2009)
Ore and waste passes and an underground crusher were established. At the end of 1955 two stopes were in production. Shrinkage stoping was the main mining method utilized. According to Stone and Selway (2009) during the life of the mine, twenty-one stopes were mined and two stopes prepared for mining. One stope was reportedly prepared for mining by the blast-hole method. Figure 2 shows a typical cross section of the workings. The mined out areas are depicted in light grey. These are typically left as voids and topped by a surface crown pillar.

Figure 2: Typical cross section – showing stopes [chantiers]. Pegmatite dykes in red. (From Stone and Selway, 2009)

The concentrator started in November 1955 and spodumene concentrates were shipped to the Lithium Corporation of America Inc.’s refineries in the United States. Mine production reached 1,100 tons per day in 1956. The contract to sell spodumene concentrate to the Lithium Corporation of America terminated in 1959. Quebec Lithium decided to install a refinery on site to produce lithium carbonate in mid-1959. Lithium hydroxide and lithium chloride were being produced by 1963. A tailings area was established between Lac Lortie and Lac Roy and, as reported by Stone and Selway (2009), contains an estimated 635,000 to 680,000 tonnes of quartz and feldspar sand. Figure 3 is a composite photograph of the site taken in 1959.
The lithium market became volatile in the late 50’s and because of this the mining and refining complex operated on a periodic basis. A decision to close was made in 1966. Total production to 1965 was approximately one million tonnes of ore hoisted to produce ceramic grade and chemical grade spodumene concentrates, lithium carbonate, lithium hydroxide monohydrate as well as a small quantity of lithium chloride and feldspar. (Stone and Selway, 2009).

The Sullivan Mining Group undertook diamond drilling, geophysical surveys and feasibility studies from 1974 to 1985. The property was then acquired by Cambior Inc. in 1987. Cambior completed geophysical surveys of the property in 1988. This was followed by a period of decommissioning from 1990 to 1991 during which time the mining facilities were sold and the site rehabilitated. In 2000 Cambior produced a report summarizing the rehabilitation work completed. In 2001 this company undertook some grab sampling of outcrops and tailings in an attempt to re-evaluate the lithium deposit. IAMGOLD acquired the Quebec Lithium Mine by means of a merger with Cambior in 2006. Canada Lithium Corp. acquired the property from IAMGOLD in 2008 and through its subsidiary, Quebec Lithium Inc., has since commenced a drilling and sampling campaign and a feasibility study to develop an open pit lithium mining operation at this site. Ministère des Ressources Naturelles et de la Faune (MRNF) has notified this company that, if they plan to undertake exploration or exploitation of the tailings, a plan of rehabilitation and restoration must be submitted.

**Tenure**

The Quebec Lithium Mine was located in La Corne Township on former mining concession No. 421 covering an area of 404.69 hectares. The concession consisted of lots 51 to 59 including row IX and the south halves of lots 52 and 53 of row X. The site has been reclaimed and a Certificate of Release was issued to Gestion Iamgold Québec Inc. on December 8, 2010. The mine site is now under the ownership of Canada Lithium Corp. This company is planning to reopen the site and establish an open pit lithium operation.

**Closure**

The decommissioning and reclamation work done by Cambior has been summarized by Shannon et al. (2012):
“The site was fully rehabilitated between 1985 and 2001, including complete removal of all underground and surface plant and equipment, the mine’s head frame, and all office buildings and structures. The railway spur connecting to the C.N.R was removed and the crown pillar was fenced off and all openings sealed to the satisfaction of the Ministère des Ressources Naturelles et de la Faune (MRNF) and in conformity with Provincial safety standards.”

Additional information on reclamation of the site by Cambior is provided by Stone and Selway (2009):

“The foundations of the entrances and the stability of the principle tailing dam was validated by a geotechnical study. In April 1997, corrective measures were taken to hide the foundations and an evaluation of the sowing seeds was made. In June 1997, the site was vegetated and a fence was built to prevent particles being blown by the wind. In the spring of 1998, areas where the vegetation did not take were resown and the wind-block fence was taken down. At the time of the visit in the summer of 1999, it was noted that part of the park and dam towards Lac Roy need resowing. The remainder of the restoration work and resowing were judged to be satisfactory (sod was placed at the far east end of the tailings dam in the fall of 2009 to conform to environmental requirements).”

Stone and Selway (2009) also reported “There are 11 stopes on the first level of the mine with 11 pillars to surface.” It is assumed that the mined out stopes were not backfilled and remain as empty voids.

It would appear that Cambior submitted a request for release in 2005 that was turned down by the Province on December 9, 2005. The refusal was mentioned in an August 3, 2006 internal company memo. The following is the chain of events:

- Cambior informed in November 2005 that the tailings site did not respond fully to the rehabilitation requirement requested and that the vegetative cover did not seem to be sufficient.
- Joint site inspection by MRNF and Cambior officials in June 2006. It was decided that the only way to restore the vegetative cover was to apply good quality topsoil.
- Internal company memo (August 3, 2006) states that the “Ministry of Energy and Resources has refused to release the site and that revegetation must be completed by the end of 2006 or they must pay $14,164 to the Department.”
- A revegetation project was completed for Cambior September 14-19, 2006 on 4.35 hectares of tailings. Work on the tailings consisted of applying 10 cm of topsoil, then harrowing, fertilizing and seeding.

In November 2006 IAMGOLD acquired the Quebec Lithium site following its merger with Cambior Inc.
Application for Certificate of Release

Division III of the Mining Act of Quebec, “Protective measures and rehabilitation and restoration measures” outlines the requirements for obtaining a “Certificate of Release” in the following Sections:

232.10. The Minister may release any person from his obligations under sections 232.1 to 232.7 and issue to him a certificate to that effect,

(1) where he agrees to letting a third person assume the obligations;

(2) where, in his opinion, the rehabilitation and restoration work has been carried out in accordance with the rehabilitation and restoration plan approved by him and no sum of money is due to him with respect to the performance of the work and, where there are tailings, they no longer present any risk of acid mine drainage. 1991, c. 23, s. 65.

232.11. The Minister may, if applicable, with the consent of the person referred to in the second paragraph of section 7, enjoin a person who, before 9 March 1995, carried out work or operations referred to in subparagraph 1, 2 or 3 of the first paragraph of section 232.1 and who is not covered by that section, to submit, within the time indicated by the Minister, a rehabilitation and restoration plan for the land affected by tailings, in accordance with the requirements of section 232.3, to the extent that the tailings result from the person’s activities, and to perform the rehabilitation and restoration work required by the presence of the tailings. The Minister shall prescribe the nature of the work and the time within which it must be carried out, after consultation with the Minister of Sustainable Development, Environment and Parks (MDDEP).

If the person concerned fails to comply with the prescriptions of the Minister within the time fixed, the Minister may cause the plan to be prepared or the work to be performed at that person’s expense.

The second paragraph of section 232.5 and sections 232.9 and 232.10, adapted as required, apply for the purposes of this section. 1991, c. 23, s. 6; 1994, c.17, s. 75; 1999, c. 36, s. 158; 2003, c. 15, s. 28; 2005, c. 3, s 35.

232.12. Nothing in sections 232.1 to 232.11 shall affect or restrict the application of the Environment Quality Act (chapter Q-2). 1991, c. 23, s. 6.

233. No person may move, disturb or damage a facility erected under this division, unless he has the authorization in writing of the owner of the mine. 1987, c.64, s. 233.
The following outlines the chronology of IAMGOLD’s application for a certificate taken from internal reports provided by IAMGOLD and MRNF:

- A December 2006 internal company report indicated that restoration work was completed and awaiting an inspection by government officials in June 2007. However much of the September revegetation effort was damaged by frost.
- Fencing and warning signs were installed around some holes in February 2007.
- Site visit by company official and contractor in May 2007.
- May 4, 2007 site inspection found deficiencies in revegetation.
- The following work was completed by a contractor between May 14-15, 2007: backfill an underground conveyer tunnel, bury approximately six waste sites, backfill a concrete structure, backfill eight depressions caused by stacks of concrete blocks, bury several concrete blocks that were sticking out of the ground and demolish a wooden decant tower. It was noted by the contractor that the subsidence treated was in no way related to the raises or mine shaft. The reseeding of 3.8 hectares of the tailings was completed at the expense of the contractor. Company officials anticipate that the site would pass inspection by government officials in June 2007.
- IAMGOLD submits request in July 2007 to abandon mining concession 421 and asks for a Certificate of Release.
- Internal December 2007 company report summarizes work done at the Quebec Lithium site.
- A joint site inspection by MRNF and Ministry of Sustainable Development, Environment and Parks in the autumn of 2007. It was noted that a marked improvement to the vegetative cover of the tailings existed, but that a recreation vehicle trail was causing problems.
- On December 5, 2007 MRNF authorizes the abandonment of IAMGOLD’s mining concession 421. The request for a Certificate of Release is refused based on concerns of a recreation vehicle trail causing erosion problems in the tailings area.
- Canada Lithium Corp. issued mining claims for former Quebec Lithium site on March 17, 2008.
- Canada Lithium Corp acquires Quebec Lithium site from IAMGOLD in May 2008.
- IAMGOLD submits a new request for a Release Certificate on October 1, 2008. Ministry of Sustainable Development, Environment and Parks completes site visit on October 21, 2009 and is satisfied with the revegetation. Note was also taken of the installation of concrete blocks and poles to prevent ATV traffic. The company had also completed the installation of a geomembrane and turf to prevent tailings erosion. In its January 5, 2009 reply, MRNF states additional corrective measures must be taken with the tailings, in particular where a trail (purportedly caused by All Terrain Vehicles (ATV) could cause erosion of the containment dike and release of tailings.
- Site visit by MRNF on August 4, 2010. Note taken of ATV (and/or mountain bike) trails on the site. IAMGOLD subsequently held a meeting with local cottagers and
negotiated a new trail system that would avoid the tailings area. (Annie Blier, Director of Environment, IAMGOLD, personal communication, 2012).

- IAMGOLD’s release file updated by MRNF on September 3, 2010 and Certificate of Release prepared. The Certificate states that no money is due to the Minister as reclamation work is complete and that the tailings present no risk of acid mine drainage. It also states that the Certificate does not exempt IAMGOLD from obligations under any other Act.

Figure 4 is an air photograph of the Quebec Lithium site showing, in green, the most recent revegetation work completed. Building foundations and roadways from the former producer are also visible. Lac Lortie is in the upper left corner of the photo.

Figure 4: Air photograph of the Quebec Lithium site. (From Lessard, 2007)
Figure 5 depicts the Quebec Lithium site, as it existed at the end of the reclamation process.

![Figure 5: Photograph of Quebec Lithium site looking north. Lac Lortie is in the background and the mine plant site in the foreground. Photo taken circa 2009. (From Stone and Selway, 2009)](image)

**Discussion**

The application for a Certificate of Release under Division III of the *Mining Act* of Quebec appears to be a straightforward process administered under a “One Window” approach. Basically, the site must follow the proponent’s closure plan, be cleared of all buildings and infrastructure, the openings to surface sealed, crown pillars protected from access and tailings dams found to be structurally sound. Tailings areas must be revegetated. The site must have no potential for acid mine drainage. As well, the proponent must be free of any financial obligations to MRNF.

It would appear that there is no requirement for public consultation, or need for long-term care and maintenance funding to obtain a certificate. The proponent does however remain liable for any obligations under any other Act, in particular the *Environment Quality Act*.

This case history illustrates a “One Window” approach to mine reclamation by government ministries. It is also a good example of difficulties encountered with revegetation projects as well as the impact on reclamation sites by recreation vehicles. Consultation with the local community by IAMGOLD led to an effective compromise with respect to recreation trails.
RENABIE MINE, ONTARIO

Introduction
The Renabie Gold Mine is located in Northeastern Ontario in the geographic Township of Leeson, District of Sudbury (Figure 1). A request was made to return the property following rehabilitation of the mine site that has been outstanding pending resolution of a First Nations land claim and environmental concerns.

Background
The mine is located approximately 20 km east of the Town of Missanabie and accessed by Highway 651 leading north from Highway 101 between the Towns of Wawa and Chapleau. The Renabie mine lies within the geological Superior Province of the Canadian Shield. The ore body is generally contained in one major ore shoot with some dislocation caused by post-ore north trending faults and dyke intrusions. The zone plunges west-southwest at 50-70 degrees and extends from surface to 4050 feet where the zone disappears. The ore consists of pyrite, very minor galena, in a quartz sericite cataclastite.

The property was actively explored in 1939 following information that was given to a local lumber company of gold bearing quartz being observed in 1920. Two more gold finds followed in 1940 prompting surface drilling the same year. Macassa Gold Mines Limited bought an 85% interest and Renabie Mines Ltd. was incorporated on January 3, 1941. The first shaft was sunk to the 281 foot level and exploration underground continued until 1942 when it was curtailed by wartime restrictions. In 1946 plans were made, equipment ordered and a sawmill set up for timber to construct the No. 2 shaft and a 300 ton per day mill. In 1947 Renabie became Ontario’s first post war gold mine to start production at a cost of $1 million. The mine operated until 1970 when it ceased due to labour shortage. Production totaled 3.6 million tons at a recoverable grade of 0.277 ounces per ton. The mine was briefly operated from 1974-76 under lease by Rengold Mine at which time it went into receivership.

In 1979 the property was acquired by Kilembe Copper Cobalt Ltd. The name changed ultimately to Renabie Mines (1981) Ltd and the mill restored to a 600 ton per day capacity for $3.5 million.

In 1981 production commenced and exploration revealed significant reserves resulting in the start of the Number 3 winze. Ownership was now equally divided by Cullaton Lake Gold Mines and Barrick Resources Limited. In 1984 the name was changed to Renabie Gold Mines Limited and by 1985 the mine was owned equally by a predecessor of Corona Corporation and American Barrick Resources Corporation. By December 1986 a modernization was completed at a cost of $23 million with the winze reaching 4246 feet and the mill capacity expanded to 700 tons per day. In 1989 Corona increased participation to 55% while 45% remained with American Barrick.

By 1990 further drilling indicated the orebody vanished by the 4050 level and scattered lenses extended at depth but could not be economically mined below the 3975 level.
In 1991 a decision was made to mine all known economic reserves and close the mine.

During 50 years Renabie processed an estimated 5.6 million tons of ore and produced 1.1 million ounces of gold.

Principal operating facilities included the underground mine with two shafts, three vent raises, one internal winze, several internal ramps and an open pit. There are 19 levels with the 250 foot drift connecting to the bottom of the “C” pit. Milling used the Merrill Crowe process for precious metal recovery using cyanide salts to leach the gold and silver then precipitated with zinc powder injection. Tailings disposal was in a natural valley formed by bedrock ridges southeast of the mill. The system included solid tailings at the head of the valley, a tailings pond at the foot followed by a polishing pond draining to the west side of Renabie Lake with several dams and control structures. The estimated amount of tailings over the life of the mine is 5.6 million tons (2.8 million cu. m.)

Notice of closure was provided in 1991 to the Ministry of Labour (under the Ontario Health and Safety Act - OHSA) and the Ministry of Northern Development and Mines (under the Mining Act).

**Tenure**

The claim status is varied and includes patented claims and claims brought to lease divided into three divisions for reference purposes. The main property consists of 43 contiguous claims located in Rennie, Leeson, Brackin and Stover townships and encompasses Renabie Mines and its surface installations, the Renabie Trailer Park (used to house mine employees) and the mine tailings.

The Frontenac claims are three detached claims approximately 500 m north of the main property on Leeson Township.

The Anglo Dominion claims are four claims for which surface rights were acquired in 1985. These parcels contain the tailings pond and polishing pond of the tailings disposal system.

In addition 9.5 acres of land in Township of West was rented from the Crown under a 20 year lease for the Missanabie Mine Trailer Park. The lease expired in 2004 and the trailer park was addressed under the terms of the lease.

**Mine Closure**

Renabie Mines provided formal notice to close the mine in June 1991 and submitted their closure plan in July 1991 following review and comment of Provincial agencies involved in draft proposals. The mine was the first to close out under Ontario’s amended Mining Act which legislated the requirement for closure plans for mining operations. The ultimate objective was to return the area to as natural a setting as possible. The Plan was accepted in August 1992.
Major decommissioning activities included:

- **Underground, fuel and chemical salvage.**
- **Crown pillar stability.** An engineering assessment concluded the pillars (4) were stable with little risk of collapse. Intention was to leave in place pending flooding of the mine estimated to occur within nine years. Temporary partial diversion of neighbouring Smith Lake created to assist. Major pillar failure occurred in early 1999 requiring immediate fencing of pillar areas and recalculation of flooding estimates. This caused a delay of surrender application. An engineered surface diversion dam was constructed to create a surface pond to cover crown pillar areas when the mine was flooded.
- **Openings to surface included two shafts and three vent raises (one of which was not addressed in closure plan), closed with engineered concrete caps, and the “C” pit, a glory hole. A Certificate for waste disposal in the C pit, from the Ministry of the Environment, was obtained to dispose of non-hazardous materials (demolition materials) with plans to slope off the sides and recontour the surface. Safety concerns were raised by Ministry of Labour to drilling off the sides so the final method used a boulder barrier around the pit. The owner later voluntarily installed chain-link fencing to further discourage entry.
- **Numerous surface buildings were demolished including the mill, headframe/crusher, compressor/electrical complex, dry, boiler house, water tower and various shops, and living quarters and the areas graded.** PCB materials were transferred from site.
- **Waste rock was contoured, covered and vegetated.**
- **Tailings management system involved dewatering and installation of dry covers and drainage diversion ditches and engineered spillway for control of the tailings. A small tailings pond and polishing pond remained to provide for cyanide breakdown from porewater.** Fish, benthic and water quality studies undertaken by company contractors occurred in concert to determine effectiveness of system. Acid generation of tailings is predicted not to be an issue based on Acid/Base Accounting (ABA).
- **Power lines to the site were de-energized and removed.**
- **Roadway was left intact as forestry operations were occurring in areas in proximity to the mine site.**

In January 1996 the site was considered closed in accordance with the closure plan. Site monitoring by the owner, Homestake Canada Inc., continued. Homestake applied to return the property in May 2001. The application was posted on the Environmental Registry in accordance with the *Environmental Bill of Rights*. Perpetual care costs for long-term care and maintenance were established at $102,290 (in 2000) with the regulator, the Ministry of Northern Development and Mines (MNDM). The Letter of Credit, held as financial assurance under the terms of the closure plan, was returned in June 2001 in recognition of the completion of rehabilitation on the Renabie site.

In the interim (from early 1998), the Missanabi Cree First Nation (MCFN) expressed increased concern regarding environmental impacts to vegetation and surface waters in their traditional areas. This was supported by Northwatch, an environmental action group,
and their sampling in the area in 2001, which indicated cyanide immediately downstream of the tailings area. While review and additional sampling by MNNDM did not identify significantly degraded water quality, these concerns were impacting MCFN negotiations for land claims in the area.

![Renabie Tailings area and C Pit](image)

Figure 6: Renabie Tailings area and C Pit (Photo credit - W.R. Cowan).

In 2006 Barrick acquired full responsibility for the site and indicated in 2007 they wished to proceed with the property release. MNNDM, as the responsible Provincial agency, had no clear policy at the time and placed the surrender review in abeyance pending resolution of the MCFN land claim and water quality issues raised. More recent inspections have located a vent raise not previously identified nor discussed in the closure plan; however the raise is capped and covered and appears on a site plan.

No further requests have been made and the site responsibility remains in Barrick’s hands. No financial assurance is currently being held as MNNDM has accepted the rehabilitation as completed in accordance with the Closure Plan. The perpetual care funding is tied to actual surrender of the property and has not been provided since a decision has not been made in that regard. MNNDM has since developed a draft policy for surrender of rehabilitated sites. This policy is intended to support the sections of the Mining Act that provide for the return of mine sites but a final policy has not been completed and no major mine sites have been returned to date.

**Applicable Legislation**
The option for surrender of mining lands in Ontario is provided in the *Mining Act* legislation under Section 183. (1):

> 183. (1) The owner, lessee or holder of any mining lands or mining rights granted under this Act or any other Act may surrender such lands or mining rights to the Crown only upon such terms as are acceptable to the Minister, and thereupon the
Minister may cause a notice of determination to be filed in the proper land registry office. R.S.O. 1990, c. M.14, s. 183 (1); 1996, c. 1, Sched. O, s. 34.

The MNDM draft policy states “The “terms acceptable to the Minister” typically refers to the monies to be submitted by the company in order to surrender the lands back to the Crown. These monies will be placed in a special purpose account and shall be used to take care of long-term or perpetual care items associated with the site (see Sections 149.1(2) and 149.1(3)).

The “terms acceptable to the Minister” could also include other things beside money depending on the circumstances when the lands are being surrendered. The Minister can require whatever he/she wants, provided the condition or requirement has a rationale to support it. Also to be noted – there is currently no appeal process for the Minister’s decision (see Section 152(1)). These “terms” essentially form the conditions mentioned under Section 149.1(1):

149.1(1) The Minister may, with respect to a project that has been closed out, accept a surrender of mining lands from a proponent on the conditions specified by the Minister.

The Mining Act (Section 149) also states under which conditions the land surrender may be refused:

149. The Minister may refuse to accept a voluntary surrender of mining lands or mining rights under section 183 if he or she has reasonable grounds for believing that a proponent has failed to rehabilitate the site in accordance with a filed closure plan or, if no closure plan has been filed, in accordance with the prescribed standards for site rehabilitation.

Therefore, the surrendering is predicated on the fact that these lands have been rehabilitated as per an accepted closure plan. The closure plan has as its main goals the removal of human health and safety hazards, the removal or securing of environmental contamination and mine wastes, the long-term protection of the environment, and the return of the lands to some productive land use. If a proponent has met the requirements of their closure plan and is willing to compensate the Crown sufficiently for those items requiring long-term or perpetual maintenance on the site, then the Ministry will consider the issuance of an exit ticket.

Of particular significance to Section 149 is the permanent removal of future environmental liabilities attached to the lands once these lands have been surrendered to the Crown. This is expressively defined under Section 149.1(4).

149.1(4) Despite subsections 7 (1) and 8 (1) and sections 17, 18, 43 and 44 of the Environmental Protection Act, a proponent who surrenders mining lands under this section is not liable under those provisions. 1996, c. 1, Sched. O, s. 26.
MNDM Draft Policy states: “It is this permanent shift of environmental responsibility from the private owner to the public that ultimately the Crown must be concerned”” (Reference MNDM Draft Policy).

Discussion
- MNDM Policy for surrender of mining lands is in draft stage only and has not been completed by the Ministry for public comment.
- Renabie commenced this closure plan concurrent to the changes to the Ontario Mining Act dealing with mine site rehabilitation for which policies and agreements with other provincial regulatory agencies were being formulated.
- Failed crown pillar during monitoring of the post-closure period resulted in lack of faith in the geotechnical assessment for the balance of the pillars and a change in plan for fencing until flooding of the crown pillar areas was completed to prevent future access.
- Change in plans for the “C” pit rehabilitation due to a safety concern by the Ministry of Labour. This resulted in lack of agreement to drill, slope off the sides and contour the surface leaving an open hole that ultimately relies on fencing for protection against falls. It should be noted this predated the production of Memoranda of Understanding with various review agencies to coordinate review activities.
- Other commercial activities in area using materials from tailings structure as borrow material for road construction, and the need to clear spillways due to beaver intrusion, point to the necessity for periodic site monitoring long-term.
- First Nations involvement occurred only following their direct request and principally after completion of physical restoration activities. This led to direct objection to the Crown to accept surrender of lands during land claim negotiations. In addition, concern was expressed about environmental issues dealing with use of vegetation in the immediate vicinity for traditional uses and water chemistry in downstream water bodies. Additional field evaluations by the regulators may not have fully addressed these concerns and there are no active coordinated discussions underway.
- More recent discovery of a vent raise may require additional discussions for site surrender.

Conclusion
The Renabie Mine site provides a good example of an attempt to return an active historic mining property to the regulatory authorities. While the major risk areas have been identified and initially accepted by the regulatory authority, there remain concerns with the local First Nations community. This case demonstrates the need for long-term monitoring and maintenance and a sound policy/regulatory regime for funding these activities without which the process founders. It also demonstrates the need for a coordinated approach and the importance of community involvement in the closure and post-closure process to foster clarity and understanding.
POLARIS MINE - NUNAVUT

Introduction
The Polaris Mine, located on Little Cornwallis Island, Nunavut (Figure 1) was constructed in 1980, opened in 1981 and closed in September 2002. Rehabilitation of the site was completed in 2004. While the site owners expressed interest in returning the property having completed the terms of the operating licence, the regulatory authorities feel this would be premature. Monitoring of the site is continuing (see papers by Donald, 2010; 2011).

Background
The mine site is located at latitude 75°23’N and longitude 96°55’W, approximately 100 km from Resolute Bay to the southeast and is owned by Teck Metals Ltd. (formerly Teck Cominco Ltd.).

It is the world’s northernmost metal mine lying 1000 km north of the Arctic Circle. Ore reserves occurred between 60-300 m. below surface. The mill, maintenance facilities, warehouse and offices were constructed on a barge and transported to the site. Other major structures comprising concentrate storage, fuel tank farm, employee accommodations (for up to 240 persons) and thickener building were constructed on site. Concentrates from milling operations were stored until shipping season then transported to Belgium for smelting. Tailings were piped 5 km to the thickener where excess water was recycled to the mill and the tailings deposited into the bottom of Garrow Lake, a meromictic water body. A dam was constructed in the outlet of the lake in 1990-1991 and a siphon then used to control the lake level. Construction of the mine and facilities, including docking, commenced in 1980 with production following in late 1981. The annual production of 1 million tonnes of ore produced 250,000-300,000 wet tonnes of zinc and lead concentrates. Underground operations occurred within the permafrost zone and were accessed via four portals. Mining used sublevel blasthole methods, which left rib pillars between primary stopes for eventual recovery. Voids were backfilled with quarried rock and mine development waste initially consolidated with water as mining occurred in the permafrost. The mine switched later to cemented backfill with higher strength properties to improve recovery.

Cost of closure was on the order of $70 million and was held as a model for remote closures requiring detailed logistical planning and dealing with the Arctic climate.

The climate is characterized as cold and dry and no significant hunting and trapping occurs.

The Polaris orebody lies near the top of the Thumb Mountain Formation of Ordovician age. This formation is a relatively homogeneous section of thin to medium bedded limestones which are brecciated and dolomitized in the area around the orebody. The deposit is described as a Mississippi Valley-type orebody. Ore minerals are sphalerite and galena with the waste being predominantly dolomite with calcite and marcasite. The ore is quite porous with voids generally filled with ice as the mineralized zone lies within the permafrost. (Drake and Keohane, 1985)
The following figure shows the Polaris Mine surface structures and loading dock while in operation.

![Surface structures and loading dock - Polaris Mine](image)

**Figure 7: Surface structures and loading dock - Polaris Mine**

**Tenure**
The site is located on land leases issued by the Government of Canada. A number of these leases have now expired but key mineral claims have been retained.

**Permits and Approvals**
Water use and protection of fresh water resources, including deposit of waste, is regulated by a Type A water licence issued by the Nunavut Water Board. Both the water licence and land leases require a reclamation plan for approval.

No formal EA process was required prior to the start-up of the mine. Background studies prior to mine development provided information on wildlife and Inuit hunting and trapping historical activities. Prior to actual closure a staged environmental site assessment was conducted (1999-2000) using protocols established by the Canadian Council of the Ministers of the Environment. Risk-based remedial objectives for soil metal levels were developed and accepted by the Water Board and Indian and Northern Affairs Canada (INAC). No federal or Nunavut guidelines for hydrocarbons in soils were available so Yukon standards for parkland use were adopted.

**Consultation and Transparency**
Consultation on the development of the closure plan was undertaken with a number of meetings across Nunavut with a broad selection of regulators and local residents. In order to further involve community knowledge and experience, the consultant contracted to undertake the environmental site assessment employed a member of the Inuit community from the initial stages through final reclamation activities. Conditional joint approval of the Plan was provided in April 2002 (submitted March, 2001) by INAC and the Nunavut Water Board.

Monitoring post-closure activities included an Inuit elder in the program. The quarterly and annual reports to the Nunavut Water Board included an appendix with a summary of site activities and monitoring results translated into Inuktitut.
Mine Closure
Major decommissioning activities included:

- Openings to surface. Access to underground was via four portals, which were closed with cemented seals and backfilled tightly to surface. Backfilling of stopes was an integral part of the mining process for the majority of the area. One area not backfilled in early operations did subside and was used as landfill for surplus equipment, supplies and surface material. For the remainder of the mining area some minor subsidence has occurred but is not visible to the eye.

- Waste management structures. All tailings were disposed in Garrow Lake. The dam used to raise the water level to address a spill during operation was removed and the lake level was restored to original level, eliminating the need for ongoing inspection and maintenance.

- Waste rock. Waste rock was utilized for backfill, closure of landfills and site contouring.

- ARD management facilities. No treatment facilities are required. Tailings have sub-aqueous cover in Garrow Lake.

- Chemical storage, sludge storage, fuel storage, explosives. Hazardous materials were removed from site. Liquid hydrocarbons were incinerated in an on-site incinerator designed to meet emission standards. Contaminated soils were deposited underground and in landfill. Soil levels were established by health risk assessment.

- Buildings, infrastructure. All surface infrastructure was removed, demolished and landfilled. This included the docking facilities. Supporting sheet piles were cut 3 m. below the harbor water surface.

- Landfills. Three landfills were established in permafrost, covered and contoured.

Post Closure Monitoring and Maintenance
Post-closure monitoring was required following completion of rehabilitation activities in 2004. While operating, the mine was subject to the federal Metal Mining Effluent Regulation; however, the mine achieved closed status in 2006 and is no longer subject to the regulation. The licence issued by the Water Board contained and continued a number of sampling requirements principally dealing with water chemistry in Garrow Lake and discharge, thermal monitoring of the permafrost in landfill areas and surface settlement.

Five years of post-closure monitoring indicated the site is physically and chemically stable to the point the regulators reduced the financial assurance from $33 million to approximately $3.5 million in 2009. While the licence expired in 2011, under the Nunavut Water and Surface Rights Tribunal Act, obligations for the site remain with the owner. Questions regarding zinc concentrations in Garrow Lake were raised by federal consultants; these were subsequently resolved by additional field sampling and analysis. Concerns were raised regarding possible subsidence in the mine workings as there is a lack of some information, principally involving operational records for completeness of backfill of the mine stopes, which makes resolution difficult at this stage. Teck’s geotechnical consultants have reviewed this and concluded that while the risk is low, some future subsidence can’t be completely ruled out.
**Financial Assurance**
Regulators have the authority to establish security deposits for reclamation of projects. The form of the security must be in accordance with the requirements of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act and Regulations (2002)* and the specific requirements of the landowners where applicable. The relevant permitting/licensing board will establish the amount of security required, and the Minister of INAC (renamed Aboriginal Affairs and Northern Development Canada (AANDC) in 2011) will give the final approval. As the licence expired in 2011, discussions are ongoing with the view to renew the licence for an extended monitoring period. There is currently no legislation or policy in place to address site return and long-term inspection and maintenance.

**Discussion**
The reclamation of the Polaris Mine site has been completed in a progressive manner with formal consultation and community input. The approaches taken are technically sound considering there are cutting edge issues in dealing with climate change and permafrost. Completion of physical activities within a 2-year timeframe, given the logistical and climate conditions encountered indicates significant effort by the site owner. Monitoring of the site over the 5-year period following closure indicated no major physical or chemical issues.

As the site closure objectives were for a walk-away situation the owners initiated discussion for the possible return of the site to the Crown. The regulators on the other hand feel a seven-year monitoring program was not sufficient and are concerned about return of properties without long-term trend data and analysis. In addition there has been a subsidence event and the owner has provided an additional geotechnical report that indicates that a significant risk is low but cannot be completely discounted.

The regulators do not have legislation in place nor policy to deal with return of lands and acceptance of financial assurance. The Minister of AANDC, where completion of rehabilitation is accepted as complete, can issue a letter to that effect. While that may be a benefit with respect to financial assurance, it does not speak to return of lands, nor future liability. While AANDC is currently looking at projected costs and using net present values, nothing firm is in place. This creates further unease in accepting return of lands based on short-term monitoring trends.

**Conclusions**
The Polaris Mine is a unique mine rehabilitation project given its extreme northern location and use of permafrost for encapsulation of wastes. As some subsidence did occur, although relatively minor in nature, the possibility of future occurrences gives the regulators cause for concern. Given the costs of monitoring in remote locations, the use of relatively untried technology in permafrost, and no authority to provide for financial assurance for the long-term, the regulators would prefer an extended monitoring program to establish long-term trends. It is Teck’s intention to apply for a Type-B water license that provides for regulatory monitoring as well as a vehicle for reclamation security.
GREGG RIVER COAL MINE, ALBERTA

Introduction
The Gregg River Coal Mine (Figure 1) is located in the Front Range of the Rocky Mountains about 40 km south of Hinton Alberta and about 275 km west-southwest of Edmonton (Townships 47 and 48, Range 24-25 west of 5th meridian). It is close to Jasper National Park in an area that is generally environmentally sensitive due to the presence of wildlife, recreational opportunities and spectacular scenery. It is of interest to this study as reclamation works are nearly completed and the owners may wish to return the surface lease to the Crown in the near future.

Background
The mine is located at latitude 53° 05’ N and longitude 117° 26.5’ W. Coal mining has been a commercial endeavor of the area for more than a century in both underground and surface mining modes. The area is characterized by steeply sloping terrain (30-45 percent), the result of folding, faulting and uplifting of the sedimentary bedrock during mountain building processes. Elevations range from about 1400m to 2000m above sea level. Climatic conditions are rigorous with severe winter conditions, Chinook winds and potentially hot dry summer periods.

Mineral rights were obtained by Manalta Coal Ltd. and an Environmental Impact Assessment was submitted to the Alberta Government in 1975. Mine construction commenced in 1981 with commercial coal production beginning in April 1983 using a conventional open pit, truck and shovel operation. Nominal capacity has been variously stated at 7,800-10,000 tonnes per day (tpd) and a stated annual production capacity of 2.1 million tonnes per year although annual production of 3.8 million tonnes was reported in 1991 and 1993. Production ceased in October 2000 reportedly due to low prices, high production costs and unfavourable geologic conditions; production in 2000 was reported at 1.0 million tonnes.

Coal production at this mine was derived from the Jewell Seam, which occurs in the Grande Cache member of the Gates Formation of Lower Cretaceous age. The Jewell Seam coal was deposited as peat in a transitional marine to non-marine environment. It occurs in thicknesses of 5-30 m with a pre-deformational thickness of 10-12m prior to structural thinning and thickening. Prior to mining the reported reserve was 47 million tonnes of medium-high volatile bituminous coal. In the early years virtually all of the produced coal was shipped to Japan for use in steel manufacturing plants. During the life of the mine over 350 million tonnes of rock were removed to produce 45 million tonnes of coal.

The mine has a relatively complex ownership history. Preproduction exploration and environmental work was completed by Manalta Coal Ltd. Gregg River Resources Ltd. (GRRL), the operator of the mines, signed a $30 million contract with Japanese interests (partner) in 1981 to supply 2.1 million tonnes per year beginning in 1983. The Japanese partner took a 40 percent equity interest in the mine itself, Gregg River Coal Ltd., while
Manalta Coal Ltd. retained 60 percent. As well, the Japanese partner provided 40 percent of development costs – approximately $72 million of $180 million.

In 1997 Manalta Coal Ltd. was acquired by Manalta Coal Income Trust, which, in turn was taken over by Luscar Coal Income Fund in September 1998. Subsequently Manalta Coal Ltd. and Luscar Ltd. were amalgamated as Luscar Ltd. in January 1999. Luscar Ltd. now owned and operated the Gregg River Mine. In April 2001 the Sherritt Coal Partnership (Partnership of Sherritt International Corporation and the Ontario Teachers’ Pension Plan Board) completed several transactions resulting in the Luscar Coal Income Fund being wholly owned by Sherritt Coal. The site is currently managed by Coal Valley Resources Inc., a subsidiary of Sherritt Coal.

Post-Mining Consultation and Land Use Planning

Very little consultation took place immediately following the closure of the mine and commencement of reclamation in 2000. Considerable consultation, which occurred during operations, was related to specific authorizations and authorization extensions and for a proposed western extension of the mine that did not take place. Considerable consultation occurred during review of the Environmental Impact Assessment (EIA) and many permits. In 2006 there were about 122 existing Approvals and Licences in place for this mine: 67 from Alberta Energy and Utilities Board; 46 from Alberta Environment; seven from Alberta Public Lands; and two certificates for storage tank registration (B. Ludwig, Pers. Com 2012).

Though post-mining reclamation scenarios were provided by Gregg River during mine permitting, the mine’s location adjacent to Jasper National Park and the Luscar mine, and the needs of other competing land users (hiking, hunting, etc.) lead to the formation of The Luscar and Gregg River Mines Land Management Plan Working Group in 2006 to develop a land use management plan for the area. Working group membership included representatives from both mines, Alberta Sustainable Resource Development (ASRD), Alberta Environment and Yellowhead County. The process both engaged and provided for collaboration between local and provincial government, industry, stakeholders and the public. Both mines are located on Mineral Surface Leases issued under the Public Lands Act; these may ultimately be returned to Crown Alberta under the management of ASRD. Various interested parties were engaged in the process through meetings, focus group sessions, and field orientation sessions for the distribution of information. A vision was developed for this planning that states “the plan will conserve wildlife and protect watersheds.” This vision encompasses the stated reclamation objectives for the Gregg River Mine.

The Land Management Plan comprises five goals, each with related objectives and strategies. Briefly these goals include: sustainable wildlife and fisheries resources; sustainable healthy and productive water and watersheds; sustainable recreational opportunities; effective stewardship; and provision of compatible commercial and industrial opportunities. Included in the latter is the possibility of future mining of remaining coal resources, as the mining company will/may retain exclusive sub-surface rights for coal.
A summary of the development of this plan is found at the following URL:

Additional references pertinent to this planning exercise include Karmacharya et al., 2011; and Government of Alberta 2011.

This Land Management Plan is in the final stages of being accepted by the Government of Alberta. Implementation will be supervised by ASRD. It remains to be seen how successful this approach will be in the long-term for areas containing multiple industrial complexes such as several mine sites.

**Decommissioning and Reclamation Requirements**

Approval for Decommissioning and Reclamation of the Gregg River Mine and Coal Processing Plant was received in June 2006 pursuant to the *Alberta Environmental Protection and Enhancement Act*; this approval required the submission of a Decommissioning and Land Reclamation plan that included but was not limited to the following:

"**Decommissioning**

The plan for Decommissioning referred to (in the approval) shall include, at a minimum, all of the following:

(a) a plan for dismantling the plant;

(b) a comprehensive study to determine the nature, degree and extent of contamination at the plant and affected lands;

(c) a plan to manage all wastes produced at the plant during operation and decommissioning;

(d) evaluation of remediation technologies proposed to be used at the plant and affected lands;

(e) a plan for decontamination of the plant and affected lands in accordance with the following (some text not shown) – this included numerous guidelines for testing various contaminants;

(f) confirmatory testing to indicate compliance with the remediation objectives; and

(g) a plan for maintaining and operating contaminant monitoring systems.

**Land reclamation**

The plan for the Land Reclamation phase shall include, at a minimum, all of the following:

(a) the final use of the reclaimed area and how equivalent land capability will be achieved;

(b) removal of infrastructure;

(c) restoration of drainage;

(d) soil replacement;

(e) erosion control;

(f) revegetation and conditioning of the plant including:
(i) species list, seed source and quality, seeding rates and methods;
(ii) fertilization rates and methods;
(iii) wildlife habitat plans where applicable; and
(g) reclamation sequence and schedule.”

Decommissioning and Reclamation
The Gregg River Mine site encompasses a total area of about 2,736 hectares of which about 1,362 hectares was disturbed during mining operations. Approximately 346 hectares of the disturbed area were reclaimed through progressive reclamation during production operations, the remainder being reclaimed following mine closure. The earth works and initial revegetation component of reclamation is now deemed to be 100 percent complete though achievement of some revegetation objectives remain.

Approved end uses for the site included watershed protection, creation of wildlife habitat and commercial forestry although commercial forestry potential has since been found to be limited to about 10 hectares in this mountainous terrain with severe growing conditions. The post-mining landscape generally consisted of islands of undisturbed treed areas, areas of disturbed extraction sites and large areas of completed, grassed reclamation (Figure 8). Decommissioning and reclamation actions are summarized here from Brand and Etmanski, 2011, and from Brand, pers. comm. 2012.

• In general, areas more distal to the plant site were reclaimed first; this included removal of power lines and access roads and the reclamation of treatment ponds.
• Placement of waste rock within completed pits, external dumps or recontoured; five pits remained to be reclaimed at the end of mining.
• Wastewater treatment ponds were decommissioned by capping the sediments, replacing topsoil, and seeding.
• Creation of wildlife habitat, primarily targeting bighorn sheep, by leaving highwalls and pit benches for escape terrain and protection in sites located in close proximity to high quality forage (see Figure 9).
• Ripping compacted, recontoured waste rock prior to replacing cover soil and seeding to reduce the negative effects of compaction.
• Recontouring procedures that left surface depressions as sediment traps.
• Contouring and revegetation to reduce infiltration and increase evapotranspiration to limit the release of selenium from soil and rock materials.
• Choosing seed mixes that were quick rooting to limit erosion, encourage growth of tree seedlings, and that were palatable for wildlife.
• Reduction of human access to the landscape to favour wildlife; this included removal of access roads, removal of water crossings, including stream fords, construction of rough surfaces to impede traffic and the posting of no-trespassing signs.
• The processing, maintenance and office facilities were demolished and removed with thousands of tonnes of steel being recycled.

The following were completed with Department of Fisheries and Oceans, Canada (DFO) involvement:
• Removal of temporary stream crossings in mineral exploration areas.
• Removal of the Gregg River railway trestle.
• Removal of the Gregg River Road Crossing.
• Removal of the Sphinx Creek haul road crossing.

Financial Assurance
Financial security held by Alberta Environment to assure care and custody of the land until a reclamation certificate has been issued is reported to be $1,738,358 (Alberta Environment, 2011).

Reclamation Certificate
Discussions with Alberta practitioners (government and industry) indicate that the Gregg River Mine is perhaps the most advanced reclaimed coal mine site (in Alberta) in terms of being eligible to apply for a reclamation certificate that would allow the proponent to relinquish all or parts of the Mineral Surface Lease back to the Crown if all conditions were met. Certificates give priority to vegetation performance and self-sustainability. It is a very formal process. The following sections discuss the application process and eligibility issues.

Guidance regarding Reclamation Certificates flows from “Conservation and Reclamation Regulation”, Alberta Regulation 115/939 as amended, pursuant to the Environmental Protection and Enhancement Act.

Application for reclamation certificate
12(1) An application for a reclamation certificate must
(a) contain the information in respect of the specified land that is required in a form provided by the Director for that purpose, or
(b) contain the following information in respect of the specified land, where the Director does not provide a form under clause (a):
(i) a map, with references to legal boundaries, showing the land for which the certificate is being requested and the adjacent land use;
(ii) particulars of the characteristics and properties of the conserved and reclaimed land, including topography, drainage, soils, vegetation and land capability;
(iii) documentation of conservation and reclamation procedures;
(iv) documentation of the history of surface disturbance;
(v) documentation of and justification for any surface improvements to be left on the conserved and reclaimed land and written acceptance of the improvements by the registered owners of the land;
(vi) a declaration that the operator has complied with
(A) all terms and conditions of any applicable approval, code of practice, environmental protection order or enforcement order,
(B) the directions of an inspector or the Director, and
(C) any applicable standards, criteria or guidelines established under section 3(1);
(vii) the name, address and telephone number of all of the registered owners of the land;
(viii) particulars of any surface lease or right of entry order for the land;
(ix) a description of any substance present as a result of the operator’s activity on the land and a description of the nature and extent of the adverse effect caused by the presence of the substance;
(x) particulars of any remedial measures taken with respect to a substance referred to in subclause (ix);
(xi) any additional information required by an information document or requested by the Director.

(2) The Director may waive any of the requirements in subsection (1) where, in the opinion of the Director, the information is not relevant to the application.

(3) Repealed AR 167/96 s6. AR 115/93 s12; 167/96; 247/2003

**Terms and conditions**

13 An inspector may issue a reclamation certificate subject to any terms and conditions the inspector considers to be appropriate. AR 115/93 s13; 167/96

**Incomplete conservation or reclamation**

14 Where an inspector is of the opinion that specified land has not been conserved or reclaimed in accordance with section 137 of the Act, this Regulation and any applicable code of practice, the inspector may do one or more of the following:

(a) provide further direction respecting conservation or reclamation;
(b) specify an additional waiting period to allow for a further evaluation of the conservation or reclamation;
(c) issue an environmental protection order regarding conservation or reclamation in accordance with section 140 of the Act;
(d) refuse to issue a reclamation certificate. AR 115/93 s14; 167/96; 251/2001; 247/2003

**Operator liability after reclamation certificate**

15(1) Where a reclamation certificate is issued under the Act to an operator in respect of an activity referred to in section 1(t)(ii) to (viii), no environmental protection order regarding conservation or reclamation may be issued under section 142(2) of the Act

(a) more than 5 years after the date of issuance of the reclamation certificate, in a case where no approval in respect of the activity was held on the date of issuance of the reclamation certificate, or
(b) after the date of issuance of the reclamation certificate, in the case of an activity listed in Division 3 of Schedule 1 of the Activities Designation Regulation, where an approval was held in respect of the activity on the date of issuance of the reclamation certificate.

(2) Where a reclamation certificate is issued under the Act in respect of an activity referred to in section 1(t)(i)
(a) on or before October 1, 2003, no environmental protection order regarding conservation or reclamation may be made under section 142(2) of the Act more than 5 years after the date of issuance of the reclamation certificate, or

(b) after October 1, 2003, no environmental protection order regarding conservation or reclamation may be made under section 142(2) of the Act more than 25 years after the date of issuance of the reclamation certificate.

(3) Where a reclamation certificate is issued under the Act in respect of an activity referred to in section 1(t)(ix), no environmental protection order regarding conservation or reclamation may be made under section 142(2) of the Act more than 25 years after the date of issuance of the reclamation certificate.

AR 115/93 s15; 167/96; 251/2001; 247/2003

Reclamation Liability

The following sections are quoted from "An Administrative Guide to the Oil Sands Mine Reclamation Certification Process" prepared by Alberta Environment, 2011 (terms of this guide also apply to coal).

"Reclamation liability after the issuance of a reclamation certificate may arise when circumstances that were not discovered during the inquiry become apparent. In such situations, the operator may be liable to take corrective conservation or reclamation actions after a reclamation certificate is issued. The liability depends on the class of specified land.

Two situations apply.

1. **Mine Site**: An environmental protection order **cannot be issued** for conservation and reclamation purposes after a reclamation certificate is issued.

2. **Plant Site**: An environmental protection order **may be issued** for conservation and reclamation purposes for up to 25 years after the date a reclamation certificate is issued.

The following is an explanation with excerpts from the legislation and regulation describing the extent and period of reclamation liability.

**Mine Site Liability**

Operators have no liability for the conservation and reclamation of mine sites after the reclamation certificate is issued. Section 142 of the EPEA specifies when an environmental protection order can and cannot be issued. Specifically, Section 142 establishes that the land must be designated as specified land and no liability exists for operations approved under the **Land Surface Conservation and Reclamation Act**. Specified land used as a mine site is listed as an activity in Division 3 of Schedule 1 of the **Activities Designation Regulation**; therefore a mine incurs no liability for conservation and reclamation after the issuance of a reclamation certificate.

142(1) If, after a reclamation certificate has been issued, an inspector is of the opinion that further work is necessary to conserve and reclaim the specified land and
the work relates to matters that were not apparent at the time the reclamation certificate was issued, the inspector may

(a) issue an environmental protection order regarding conservation and reclamation to:
   (i) the person to whom the reclamation certificate was issued,
   (ii) a successor, assignee, executor, administrator, receiver, receiver manager or trustee of a person referred to in subclause (i) or
   (iii) person who acts as principal or agent of a person referred to in subclause (i) or (ii) directing the performance of any work that the inspector considers necessary to conserve and reclaim the specified land, or

(2) No environmental protection order regarding conservation and reclamation may be issued under this section

(a) in any case where the reclamation certificate in respect of the specified land was issued under the Land Surface Conservation and Reclamation Act, RSA 1980 cL-3, or

(b) in any other case, after the date prescribed or determined in accordance with the regulations for the purposes of this section with respect to different classes of specified land set out in the regulation.

Based on Section 142 of EPEA, the operator’s liability after the issuance of the reclamation certificate will depend upon the approved use of the land and the land designation of specified land subject to Section 1 of the Conservation and Reclamation Regulation:

(1) In this Regulation, and, in the case of clause (t), for the purposes of Part 6 of the Act,

(t) “specified land” means land that is or has been used or held for or in connection with
   (v) the construction, operation or reclamation of a mine, pit, borrow excavation, quarry or peat operation,
   (ix) the construction, operation or reclamation of a plant

For specified land that is classified for use as a mine site, Section 15(1)(b) of the Conservation and Reclamation Regulation applies:

15(1) Where a reclamation certificate is issued under the Act to an operator in respect of an activity referred to in section 1(t)(ii) to (viii), no environmental protection order regarding conservation or reclamation may be issued under section 142(2) of the Act

b) after the date of issuance of the reclamation certificate, in the case of an activity listed in Division 3 of Schedule 1 of the Activities Designation Regulation, where an approval was held in respect of the activity on the date of issuance of the reclamation certificate.

The construction, operation, or reclamation of a mine is listed under section (a) of the Activities Designation Regulation, Division 3 Schedule 1, Conservation and Reclamation. In accordance with section 15 (1) (b) of the Conservation and Reclamation Regulation,
an environmental protection order cannot be issued on a mine site after a reclamation certificate is issued.

**Plant Site Liability**
For specified land classed for use as a plant site, the liability for conservation and reclamation extends for a period of 25 years after the issuance of a reclamation certificate. Section 15(3) of the Conservation and Reclamation Act applies:

15(3) Where a reclamation certificate is issued under the Act in respect of an activity referred to in section 1(t)(ix), no environmental protection order regarding conservation or reclamation may be made under section 142(2) of the Act more than 25 years after the date of issuance of the reclamation certificate.

Section 1(t)(ix) of the Conservation and Reclamation Regulation refers to the construction, operation or reclamation of a plant; therefore the operator has a 25-year liability period for conservation or reclamation after the reclamation certificate is issued.

**Contamination Liabilities**
There are no time limits for contamination liabilities on specified land where a reclamation certificate has been issued. Contamination liabilities are established through the EPEA, Division 1, Releases of Substances Generally, section 113(1):

113(1) Subject to subsection (2), where the Director is of the opinion that
(a) a release of a substance into the environment may occur, is occurring or has occurred, and
(b) the release may cause, is causing or has caused an adverse effect,

the Director may issue an environmental protection order to the person responsible for the substance.

**Gregg River Mine Challenges**
Though considered to be a “model reclamation site” by knowledgeable specialists, there appears to be two considerations limiting Gregg River Mine from being in a position to apply for and acquire a reclamation certificate in the immediate future. Firstly, the revegetation of the mine site does not currently meet objectives or commitments of the proponent to demonstrate viable or sustainable tree growth at higher elevations where tree growth is slow and tree mortality is high due to harsh growing conditions. It has been suggested that 10-15 years or more will be required to demonstrate sustainable tree growth if a sustained, diligent tree planting program is maintained.

Secondly, Gregg River Mine is one of several mountain coal mines where mining activities have resulted in elevated levels of selenium in natural waters. Selenium occurs in rock materials in the Alberta foothills. Open pit mining operations provide conditions for enhanced weathering of these rock materials through increased exposure to erosion, run-off and oxidation. This results in elevated concentrations of selenium in water bodies and subsequently benthic invertebrates and the fish that eat them. Research on this matter has resulted in the requirement that Alberta coal mines located in mountainous settings...
have a Selenium Monitoring and Management Program proposal that includes but is not limited to:

• A plan to determine sources of selenium.
• A plan to quantify the accumulation and deposition patterns of selenium at the mine.
• A plan to determine the actual and potential effects on the aquatic environment.
• A monitoring program to determine selenium concentrations at the mine.
• Evaluation and selection of selenium management practices for the mine; and
• Any other information as requested by the Director.

The Government of Alberta is not prepared to certify lands with contamination liability. A monitoring program of selenium concentrations at Gregg River Mine indicates that concentrations have generally decreased over time since the site was reclaimed. This is credited by Brand and Etmanski (2011) to the maturing of the reclamation program that was designed to minimize the infiltration of surface water into the selenium generating rock disposal areas. It appears as if concentrations may be within the guideline limits by the time the vegetation is shown to be sustainable.

Discussion

As per above discussion on selenium, Gregg River Mine has to resolve the selenium issue with the Alberta Government before becoming eligible for a reclamation certificate. In addition, Gregg River Mine has considerable tree planting to complete prior to meeting their reclamation objectives; this is estimated to take 10-15 years or more. Though this project is one of the most advanced in Alberta for coal mines relinquishing their Mineral Surface Leases to the Crown, there remains additional work to complete.

The multi-party land use planning exercise, which is nearing completion, may provide an example of how environmentally sensitive regions with multiple industrial development opportunities can optimize on their development potential.
Figure 8: Photo of reclamation works, Gregg River Mine (Photo credit - Sherritt Coal).

Figure 9: Photo of reclaimed mine area (Photo credit - Sherritt Coal).
CONTACT LAKE GOLD MINE, SASKATCHEWAN

Introduction
The Contact Lake Mine is located in Northern Saskatchewan (Figure 1) within the Lac La Ronge Provincial Park. It is of interest to this study as the property has been returned to the Crown following rehabilitation. Site specific monitoring and maintenance activities become the responsibility of the Crown; however, funds are allocated at the time of transfer to a Monitoring and Maintenance Fund by the former site owner to the Saskatchewan government. In addition, monies are also contributed by the former owner to an Unforeseen Events Fund and placed in a general program account. The required contribution to the Unforeseen Events Fund is a calculated value based on the total amount contributed to the Monitoring and Maintenance Fund. While this fund is building a financial assurance is maintained sufficient to cover costs associated with the maximum potential failure event on the site. This was the first decommissioned and reclaimed mine site to be entered into the Saskatchewan government’s Institutional Control Registry.

Background
The mine site is located 63 km northeast of La Ronge, specifically at UTM 6141199 north and 507983 east, UTM zone 13, NAD 1927, NTS-73-P-07. The site occurs within the Mineral Exploration Zone of the Lac La Ronge Provincial Park (a zone in which mineral exploration and development are permitted). The property was originally staked in 1979 for the Saskatchewan Mining Development Corporation a predecessor company of Cameco Corporation (through merger with Eldorado Nuclear Limited in 1988). At the time of acquisition the property was owned two-thirds by Cameco and one-third by Uranerz Exploration and Mining; Cameco became 100 percent owner in August 1998. The gold deposit was found through a geochemical till sampling program and diamond drilling. The deposit is hosted within a poorly exposed, northeast trending regional shear that separates granite and granodiorite phases of the Little Deer Lake Pluton. The mineralized interval ranges between 1.5 and 15 metres and contains 5% quartz plus pyrite, chalcopyrite and minor amounts of other sulphides (TNM March 6-12, 1995). Reported reserves in January 1994 were 1,313,000 tonnes grading 8 gpt Au (grams per tonne gold) plus additional geological resources. In 1991 licensing approval was received to proceed with mine development.

Capital cost for development was estimated at $36 million which included development of an underground mine and a 700 tpd (tons per day) mill. Start-up mining commenced in late 1994 and the mine was officially opened in February 1995 by Premier Roy Romanow. The mine was projected to produce 60,000 ounces of gold per year over six years at an operating cash cost of $210 per ounce. By 1997 lower than expected grades caused reduced production at higher unit costs. In 1998 the economic resource was depleted and mining ceased in April followed by cessation of milling in June; decommissioning work commenced in 1998. Principal operational features included an underground mine accessed via a portal and ramp; a mill with cyanide leach and carbon-in-pulp circuit; and a tailings disposal facility in a natural lake.
Tenure
The Contact Lake facility was operated under Surface Lease 200096 and mineral disposition claim #S-104743 and ML-5506. Mineral claims are acquired through free-entry staking on open crown land. Claims must be converted to leases in order to obtain the right to develop and extract minerals. No surface rights come with the minerals lease. Surface development of facilities requires a surface lease obtained through negotiation with the government; this requires a negotiated agreement including the fulfillment of Duty to Consult requirement by the Crown respecting potential interference with traditional pursuits.

Figure 10: Contact Lake Mine site during operations (Photo credit, Cameco).

Pre-production Permits and Approvals
Prior to commencing construction of the mine and production numerous regulatory requirements had to be met. Brief notes on some of these follow:

- An environmental assessment following *The Project Specific Guidelines for the Preparation of an Environmental Impact Assessment* issued by Saskatchewan Environment (SkMOE). A conceptual Decommissioning and Reclamation Plan is required within this process. Public consultation is required.

- The mine is located within the Mineral Exploration Zone of the Lac La Ronge Provincial Park. Authority to mine here required considerable negotiation with SkMOE during the Environmental Impact Assessment. This resulted in several mitigative measures to be employed. Clearing of trees was to be minimized to keep the footprint as small as was feasible; revegetation was to utilize native species as much as possible; access routes were to be made impassible during reclamation through barriers, removal of culverts, scarification and the felling of trees across the potential routes. To reduce the visual impact of the mill building,
it was constructed in a basement blasted into the rock. As well, noise mufflers were installed on the main generators and mine vent fans were placed underground.

- A Fisheries Compensation Agreement was negotiated with the Department of Fisheries and Oceans (DFO) to allow mill tailings to be placed within the confines of a small nearby lake, Turtle Lake, located about 1.5 km from the mine-mill site. The lake was dewatered so they could build dikes at the outlet and then allowed to naturally fill and ultimately tailings were deposited below water via pipelines.

- Full operations at the mine commenced in December 1994 when “Approval to Operate a Pollutant Control Facility IO-82” was issued by Saskatchewan Environment and Resource Management (SERM); this approval required successive annual approvals. Such approvals require a Decommissioning and Reclamation Plan which is approved by the minister; a proposal for an assurance fund to ensure completion of the decommissioning and reclamation which is approved by the minister; and establishment of the assurance fund to the satisfaction of the minister (see section 12, The Mineral Industry Environmental Protection Regulations, 1996). Decommissioning and Reclamation Plans and funding are subject to review at least once every five years; at the minister’s request; or at the time of permanent closure of a pollutant control facility mine or mill.

- Financial assurance posted at the commencement of the operation was $250,000 provided in the form of a line of credit.

- Additional approvals were required as operations proceeded such as permitting of a Reclaim Water Treatment Plant.

Mine Closure
At the time of closure of the Contact Lake Mine, a series of approvals for decommissioning of various components of the site Decommissioning and Reclamation Plan were required, e.g. closure of stopes, tailings dyke decommissioning, disposal of waste rock, mill decommissioning etc. All in all dozens of approvals for discrete decommissioning actions; these approvals were signed off by the appropriate technical officials. Major decommissioning activities included:

- Decommissioning of underground mine - equipment salvage, removal of fuel and chemicals, deposition of non-hazardous materials underground, etc.

- Crown pillar stability – engineering assessment of seven crown pillars resulted in six being left in place in a safe condition, the seventh was blasted down and the opening filled with waste rock.

- Openings to surface - these consisted of two vent raises, two backfill raises and the portal. The four raises were backfilled with waste rock and covered with engineered concrete caps. The portal was backfilled with waste rock from surface to 20m into the mine. Though backfilling of the raises was deemed sufficient, the caps were put in place as an additional precaution against settling. SERM (at the time Saskatchewan Environment and Resource Management; now Saskatchewan Ministry of Environment) required the caps to be covered by 30cm of waste rock. These remedial measures were inspected annually until accepted into the
program; now the inspection program is based on the monitoring program approved at the time of acceptance.

- Mill decommissioning - the mill was sold to another mining company for relocation out of province. Decommissioning approval received for the mill from SERM excluded the Reclaim Water Treatment Plant and other ancillary facilities, which were dismantled and salvaged or otherwise disposed of in an approved manner.

- Decommissioning - hydrogen peroxide storage & delivery system. Hydrogen peroxide addition, which had been used in the water treatment process to assist with reduction of cyanide in the tailings management facility, eventually became redundant, as it had no further effect in improving the quality of treated effluent. Upon receipt of approval from SERM, the remaining hydrogen peroxide was returned to the original supplier, as was the storage tank.

- Decommissioning - tailings management facility. Turtle Lake had been dewatered sufficiently to provide storage space for tailings deposition and to provide a water cover for minimizing any potential acid generation from the tailings. Though acid-base accounting during operations had indicated the tailings had a Net Neutralizing Potential indicating a low potential for acid generation, for greater certainty the water cover was maintained over the decommissioned tailings which required some relocation of tailings mounds and the decommissioning of an internal dyke to ensure a sufficient cover (1.25m). Water levels were allowed to return to pre-development levels essentially recreating the Turtle Lake water body.

- Decommissioning - Reclaim Water Treatment Plant – upon demonstration that an acceptable water quality had been achieved in Turtle Lake approval was given to dismantle it, related facilities and support facilities. Chemicals were removed and non-salvageable materials were disposed of, sold for scrap, concrete foundations were covered by waste rock etc.

- Petroleum storage facility – approval to decommission was granted and required soil sampling results met decommissioning criteria. The mill fuel farm area was then covered with waste rock, recontoured and revegetated.

- Camp and associated facilities decommissioning – this consisted of several buildings, trailers and related facilities. The main camp was sold and removed from the site; related facilities (sheds, pipelines, holding tanks, etc.) were dismantled and either salvaged or disposed of in approved manner.

- Concrete foundations were carefully located for future reference and covered with a minimum of 0.29m of clean waste rock.

- Waste rock dump – the majority of waste rock in the dump was recovered and used for decommissioning of other components of the site, such as; backfilling of raises and the mill basement, and covering concrete foundations left in situ. The remaining material in the waste rock dump was recontoured and revegetated.

- Recontouring and revegetation activities were completed following decommissioning of the surface installations at the mine site. Recontouring was completed to ensure that the site was compatible with the surrounding topography and to provide a suitable surface for seed germination. Local jack pine seeds
(cones) were collected to produce seedlings for revegetation; as well an approved native seed mix was employed to promote natural succession.

- Road access reclamation included the removal of signs, signposts and barricades; removal of culverts and restoration of creeks subject to regulatory conditions/advice provided by DFO and SERM for work in and about the creeks; scarification of roadways to foster revegetation; the construction of berms and ditches across roadways to discourage vehicle access; and the felling of trees across the roads to discourage access.

**Post Closure Monitoring and Maintenance**

Upon making the decision to close the Contact Lake operation, Cameco had to seek approval to decommission many components on a case-by-case basis, e.g. stope closure, mill decommissioning etc. A Conceptual Decommissioning and Reclamation Plan was required as part of the Surface Lease agreement during operation. This plan was updated and submitted as the Site-Wide Decommissioning and Reclamation Plan, which required regulatory approval prior to implementation of decommissioning activities. This plan included the establishment of Decommissioning Water Quality Objectives against which the success of the decommissioning could be measured. These objectives were developed and proposed by Cameco, and subsequently approved by SERM, for two monitoring stations. Monitoring carried out over several years (five years at one site, 10 years at another) demonstrated that outflows were consistently below the Decommissioning Water Quality Objectives and posed negligible short-, medium-, and long-term risk to the downstream environment. Along with other monitoring results (e.g. revegetation progress, backfill settlement) this allowed the conclusion to be reached that the decommissioning and reclamation of the former Contact Lake Mine was complete and that the site was chemically and physically stable.

With respect to post-closure monitoring and maintenance, Cameco was required to submit a post-closure monitoring and maintenance plan, which included monitoring and maintenance frequencies and associated costs. This plan was reviewed by SkMOE staff and approved prior to entry into the Registry. It is important to recognize that Cameco implemented passive decommissioning strategies wherever possible so as to minimize the need for long-term maintenance and expenditures, e.g. backfilling and capping of raises. This strategy has resulted in a minimal amount of long-term maintenance liabilities.

Pursuant to compensation agreement with DFO in 1994 there was no requirement to include the re-introduction of a viable fish population.

**Release from Decommissioning and Reclamation Requirements**

Subsection 22(1) of the *Mineral Industry Environmental Protection Regulations, 1996* provides a proponent (person) with the ability to apply for release, in whole or in part, from the requirements or obligations set out in a decommissioning and reclamation plan. The written application must include (Subsection 22(2); “(a) a detailed analysis and evaluation of monitoring data and observations from the decommissioning and reclaiming and post-decommissioning and post-reclaiming monitoring program that
demonstrates compliance with requirements set out in the approval; and (b) a list and assessment of remaining environmental liabilities.”

“Where the minister approves the application, the minister shall release or refund that portion of the assurance that the minister considers proportionate with the degree to which the person is released from the requirements or obligations” Subsection 22(3)

In 2008 Cameco Corporation, pursuant to the preceding discussion, submitted a document entitled “Final Closure Report Contact Lake Gold Mine Decommissioning & Reclamation”, prepared by SRK Consulting (Canada) Inc. as an application for “Release from Decommissioning and Reclamation” from the SkMOE for the former Contact Lake Gold mine, mill and associated facilities. This report reviewed all of the key components of the plan and described how the requirements were met. Simultaneously this document was also submitted as an application for custodial transfer of the property as defined by the Reclaimed Industrial Sites Act, Chapter R-4.21 of the Statutes of Saskatchewan, 2006.

In May 2008 SkMOE personnel inspected the site accompanied by representatives from Cameco. This inspection and a post inspection meeting lead to the conclusion that “The site is in overall satisfactory condition and it is determined by ministry staff that the Contact Lake Operation site is stable and in a condition suitable to allow for the release from decommissioning and reclamation requirements and subsequent entry into the Institutional Control Registry” (Saskatchewan Ministry of the Environment 2008). The release document is issued by the Minister of Environment and signed by a delegated authority.

Release from the Decommissioning and Reclamation requirements is confirmation by SkMOE that the company has met the requirements of their Decommissioning and Reclamation Plan. With this release the company is eligible to recover any residual financial assurance posted for the operational phase of the project.

Site Relinquishment
Introduction
Saskatchewan has the most advanced Canadian regulatory regime whereby a proponent can relinquish a project to the Crown while the property continues to require long-term monitoring and/or maintenance. This was made possible through the establishment of an Institutional Control Program (ICP) pursuant to The Reclaimed Industrial Sites Act and The Reclaimed Industrial Sites Regulations. The Institutional Control Program (ICP) is very well described in a 2009 publication of Saskatchewan Energy and Resources entitled “Institutional Control Program: Post Closure Management of Decommissioned Mine/Mill Properties Located on Crown Land in Saskatchewan”

To be eligible for acceptance into the ICP a site must meet the following criteria (paraphrased from regulation):

- Site holder has completed and complied with the conditions of any environmental assessment.
- Site holder must be eligible for a release from the obligations of the Decommissioning and Reclamation Plan and related obligations.
• Site holder has submitted a monitoring and maintenance plan that identifies a) the monitoring and maintenance obligations that need to be undertaken when the closed site is accepted into the ICP and b) the present value of future costs associated with this monitoring and maintenance.
• The surface lease must be eligible for transfer to the ICP, i.e. the site holder is eligible to receive a release from related surface lease agreements.
• The mineral rights associated with the closed site are eligible to be surrendered or transferred to the Minister.
• Site holder is eligible to receive a release from any and all licences issued by the governments of Canada and Saskatchewan or their agencies.

![Figure 11: Revegetation Contact Lake fuel storage site – 2008](Photo Credit, Dale Kristoff, SkMOE).

Financial Assurance and Funding
In conjunction with accepting a closed site into the ICP the site holder must provide funding for future costs for monitoring and maintenance; unforeseen events; and a financial assurance for the cost of a “maximum potential failure event” that could occur on a closed site.

• The *Institutional Control Monitoring and Maintenance Fund* (ICMMF) is designed to fund in perpetuity the costs of implementing the monitoring and maintenance requirements identified by the site holder in a Monitoring and Maintenance Plan. Monies provided to this fund are managed independently from the provinces General Revenue fund. In the instance of the Contact Lake Mine, the present day value for future costs to conduct the monitoring and maintenance
was assessed at $32,255.72, which amount was provided to the fund in 2009 (Institutional Control Registry Report).

- Contributions to the *Institutional Control Unforeseen Events Fund* (ICUEF) are required to generate funds for future unforeseen events such as the collapse of a crown pillar or the premature failure of a shaft cap. Required contributions for this fund are as follows:
  a) for a closed site without tailings or engineered structures, 10 percent of the Total ICMMF contribution; and
  b) for a closed site with tailings or engineered structures, 20 percent of the total ICMMF Contribution.

In the instance of the Contact Lake Mine, a 20 percent contribution was required due to the presence of engineered structures. This amount was $6,451.14. In contrast to the ICMMF funding, ICUEF funding is to be combined with other such funds to create a pool of funds for unforeseen events. Once the pool of funds in the ICUEF is of significant value, the intent is that it will replace the requirement for financial assurance, described below.

- In addition to the cash contributions made to the above described funds, a site holder must provide financial assurance in an agreed upon amount that reflects the costs of dealing with a “maximum potential failure event” on the site. This assurance would have an original expiry date of five or more years and be subject to renewal every five years or as necessary. The “maximum potential failure event” in the case of the Contact Lake Mine was identified as “premature failure of a shaft cap” resulting in the financial assurance being set at $33,250.00, which is assured by a promissory note.

**Institutional Control Registry**

If all prescribed conditions of an application are met, all required documentation is provided, and the prescribed registration fee of $500 is provided, the site may be accepted into the Institutional Control Program and entered into the Institutional Control Registry (Registry) which manages all information related to the site and ensures that any required monitoring and maintenance is completed as required.

In May 2009 the former Contact Lake Mine was the first site to be accepted into the ICP.

**Indemnification**

Despite the fact that a site has qualified for entry into the ICP and that it is entered in the Institutional Control Registry, the site holder is not indemnified against all future liability as there is no provision in the *Environmental Management and Protection Act* that would allow a designated minister to waive the absolute liability.

**Consultation and Transparency**

As mentioned in a previous section the issuance of a surface lease for mining purposes requires fulfillment of “Duty to Consult” requirements by the Crown. There was also a formal and required consultation as part of the release from the surface lease, which is also a component of the entry into the ICP. Prior to accepting the site into the ICP there was an impact community consultation process wherein impact communities, identified
by the human resources development agreement under the surface lease, could raise issues. If issues raised were of a significant concern release from the surface lease may not have been issued; similarly the release from the Decommissioning and Reclamation requirements may have been withheld.

For Contact Lake, Cameco went through a comprehensive environmental assessment wherein the primary consultation for the Decommissioning and Reclamation Plan was carried out. Further consultation on the plan was only required if a particular action was a departure from the approved plan. Prior to receiving a release from Decommissioning and Reclamation, SkMOE placed posters in and around La Ronge and letters were sent to the impact communities identified in the Surface Lease Agreement notifying people that the Contact Lake gold mine was going through this process and was about to be granted a release. If people had questions or concerns they were to contact SkMOE.

**Discussion**
The Contact Lake Site was ideal for becoming the first mine accepted into the ICP for several reasons, most of which can be attributed to good management and planning as follows:

- Contact Lake Gold Mine was developed and operated with decommissioning in mind. The site is located within a Provincial Park which resulted in additional strategies being implemented to reduce the aesthetic intrusion of the mine site by reducing its footprint. Saskatchewan Parks were consulted throughout.
- The mining methods, rate of production and the less than planned mine-life resulted in relatively modest quantities of waste rock and tailings to manage.
- The reactivity of the waste materials was such that it was possible to manage Acid Mine Drainage (AMD) effects without invoking any long-term treatment strategies.
- The use of a natural lake basin for tailings confinement and, ultimately, to provide a water cover for the tailings, was pivotal in the reduction of long-term management requirements. This is an excellent demonstration of wise use of the Fisheries Compensation Agreement option.

The requirements for being accepted into the Institutional Control Program have many linkages and appear to be comprehensive and complete.

**Conclusion**
The Contact Lake Site provides an excellent demonstration of the Saskatchewan model for accepting reclaimed industrial sites into an Institutional Control Program. The site is relatively low risk for developing future issues for the Province, financial, social or environmental. Future acceptance of higher risk projects with much higher financial requirements will be of great interest. The funding formula for unforeseen events does not appear to be able to raise sufficient funds when viewed simply on a single site basis. However, the program is designed to accrue a pool of funds from numerous sites over the years which would cover off major failures. Saskatchewan would probably not accept a site if there was a significant risk of major failure.
Introduction
The Farley East Tailings Management Area (ETMA), (Figure 12) is located at the Town of Lynn Lake in Northern Manitoba, some 230 km north of Flin Flon (Figure 1). It is of interest to this study as the former owner has been released from all liability following many years of negotiation and/or partnering between the Manitoba Government and Viridian Inc./Agrium Inc. to rehabilitate the site. The focus of this case history is on the release from liability for the ETMA. All features to the west of the ETMA, including the mine and mill sites, have been dealt with under a separate agreement between the Manitoba Government and Black Hawk Mining Inc. [BHK (subsequently Central Sun Mining Inc.)]

Figure 12: Looking east to the former mine-mill complex and ETMA. (From Priscu et al. 2010)

Background
According to Ruttan (1957) prospecting in the Lynn Lake area commenced in 1937, cumulating with the discovery of significant nickel and copper mineralization in 1941 by a Sherritt Gordon company prospector on a gabbro outcrop adjacent to a small lake named Lynn Lake. This was followed by several years of geophysical surveys and diamond drilling. Five deposits were outlined by 1947. A sixth deposit discovered in January 1947 was of sufficient high grade to justify commencement of mine development. Over the next eight years the company undertook surface and underground exploration, development of a new metallurgical process, and construction of a mining and milling complex with a refinery in Alberta. Canadian National Railways constructed a rail line to the site during this time period. The company made Canadian history with the relocation, from Sherridon (some 90 kilometres North East of Flin Flon), Manitoba,
of its entire former copper-zinc mining complex over winter and ice roads using bulldozer “Cat-Trains”.

Mining commenced in 1953 lasting until 1976 with over 20 million tonnes of nickel-copper ore produced, making it the third most important nickel producer in Canada. According to the Manitoba Mines Branch, the Farley mine was in production from 1953 to 1976; conflicting information suggests that shaft sinking commenced in 1955 with production from 1961-1976. The mill operated from 1953 till 2002 treating nickel, copper, zinc, and in later years, gold ores. The East Tailings Management Area (ETMA) was created in 1952 as part of a larger tailings reserve area.

TetrES (2006) have summarized the production activities of the three Lynn Lake mines operated by Sherritt Gordon Mines Ltd. between 1953 and 1975. The “A” mine operated from 1953 till 1969, and produced about 13 million tonnes of nickel and copper ore. The “EL” produced approximately two million tonnes of nickel and copper ore between 1954 and 1964. The remainder of the production came from the Farley mine, which operated from 1961 (sensu stricto) till 1976. The mill was utilized by a number of operators, the last being Black Hawk Mining Inc. (BHK) until 2002. BHK gold mine tailings were directed to the west tailings area.

The name of Sherritt Gordon Mines Ltd. was changed to Viridian Inc. in 1996; Viridian was acquired by Agrium Inc. in the same year.

Lang et al. (1970) state “The orebodies, ten in all (of which three have been mined out), occur mainly in a variety of intrusive rocks of gabbroic character, but one orebody is in a siliceous, fine grained, variable quartz hornblende diorite.” The main ore minerals are reported to be pyrrhotite, pentlandite, and chalcopyrite. Only minor pyrite is present. “The sulphide minerals occur as massive or breccia type concentrations, disseminations, or stockworks.” “The orebodies are irregular to lenticular in plan, and pipe-like in section (Lang et al. 1970).”

Ruttan (1957) reports that the nickel-copper sulphide deposits were present in two mafic plug-like intrusions. The northernmost, termed “A” plug, is about 3660 metres long and 1520 metres wide and contained six deposits. The “EL” plug that contained the “EL” orebody lies about 1070 metres south of “A” plug. It is a small circular pipe-like mafic intrusion about 370 metres in diameter. Ruttan also mentions the presence of cobalt, zinc and gold in minor amounts.

During the life of the mining operations three production sites were established. The mill, relocated from the former Sherridon operation, took ore feed from all of the Sherritt Gordon deposits at Lynn Lake. A large tailings area was established to the east of the mill. In more recent years the mine site has been referred to as the Farley mine and the tailings area as the East Tailings Management Area (ETMA). A rail yard also made up part of the complex. The tailings from the nickel-copper sulphide mining operation, estimated at 22 million tonnes (TetrES, 2006), have a high sulphide content.
A report by TetrES (2006) presents an overview of the mining operations and tailings management. The ore was treated using the flotation method to recover the copper and nickel. The tailings were discharged as an alkaline slurry into the western edge of the ETMA with the coarser tailings forming part of the “cyclone” pile. The finer materials flowed eastward to what was called the “slimes” area. A number of semi-permeable waste rock dykes held back the tailings while allowing the effluent to flow through a number of weirs into the Lynn River. The tailings were eventually submerged under water as mining continued. At the cessation of mining in 1976 about 250 ha of the ETMA dried out resulting in tailings dust storms and acid mine drainage caused by the introduction of oxygenated waters by precipitation and groundwater fluctuation.

**Figure 13:** Air photo showing ETMA boundaries (dashed yellow lines) as per Bilateral Agreement. From Priscu et al., 2010.

**Tenure**

The original Lynn Lake mineral discoveries were staked by Sherritt Gordon staff in the mid-1940’s. Manitoba Mines branch records show that as mine development progressed the ETMA was created and held as Surface Lease M124. Schedule “B” of a draft agreement between the Government and Manitoba and Viridian Inc. gives the boundaries of East TMA as follows: “The East TMA is located between the east side of the mill site and the Lynn River. The sketch in Schedule “A” ETMA 01 is bounded by the following
four coordinates (101° 01.90’, 56°51.45’); (100°59.08’, 56°51.62’); (101°00.00’, 56°50.00’ and (101°02.26’, 56°49.80’), excluding West TMA.” The approximate location of ETMA is shown on Figure 13.

**Human Health and Environmental Risk Assessment for Lynn Lake**

The site was identified as a high-risk site in 1998 by Manitoba Conservation based on environmental degradation and public health and safety concerns expressed by First Nations and Town Council. Manitoba Conservation contracted for a “Human Health and Environmental Risk Assessment” study for the ETMA, which was completed in 2003. “This program would ensure that the remediation measures proposed are scientifically sound and that measures taken to properly “manage” the sites are based on the risk to the environment and to the health of the residents” (Dillon, 2003).

Prior to the Human Health and Environmental Risk Assessment Study, Manitoba Conservation established a Technical Advisory Committee (TAC) in 2001 to gather community and technical input. The TAC was comprised of provincial government medical advisors along with public health, environment, and mining officials. The Town of Lynn Lake and Marcel Colomb First Nation were represented, as were several consultants.

Extensive sampling was undertaken of soil, surface water, groundwater, vegetation, and air. Based on screening guidelines, aluminum, copper, iron lead, nickel, manganese and particulate matter were identified as contaminants of potential concern. Residential exposure scenarios included all receptor age groups from infants to adults. Eleven potential exposure pathways were assessed including contact with and ingestion of soil and dust; locally grown fruit and vegetables; locally caught fish; drinking water and swimming areas. The Human Health component of the survey concluded that exposure to metals were below levels of potential concern for human health. However the report stated that particulate matter from dust storms created a potential for adverse reactions to people with respiratory ailments.

The Environmental Risk Assessment was designed to look at and document potential harmful impacts on terrestrial and aquatic environments, especially the impact on sport fishery, recreation, and locally grown food. Local impacts in the Lynn River - from the mouth of Town Ditch to the Keewatin River, a distance of three kilometres, were documented. The study focused on concentrations of contaminants in soil-water and sediment. The ETMA was verified to have been a major cause of contamination of the Lynn River. Impacts are present upstream of Eldon Lake and to the confluence of the Keewatin River. Studies of the river found the presence of tailings, elevated concentrations of metals, decreased pH, and an apparent impact on benthic and fish populations. Terrestrial contamination included acidic run-off, elevated concentrations of metals and stressed vegetation. Terrestrial impact was related to surface run-off from the ETMA to the SW and SE of the Lynn River (see Dillon, 2003).

Peer review workshops were held during the preparation of the Human Health and Environmental Risk Assessment report. Peer review workshops were also held with the
Technical Advisory Committee to develop conceptual action plans, evaluate work progress and review action plans.

A report released by MiningWatch Canada in May 2004 expressed a number of concerns about the Human Health and Environmental Risk Assessment study. This included the concern that there was no human sampling for metals, and no medical or epidemiological studies completed. The MiningWatch report also mentions that no risk management recommendations were made. http://www.miningwatch.ca/after-mine-lynn-lake-manitoba

Mine Closure
The site is located adjacent the Town of Lynn Lake with a portion within the Municipal boundary, and also lies within traditional lands of two First Nations. The site comprised underground workings with headframe complex, mill, load-out area, auxiliary surface structures, mine/mill ponds, and two distinct tailings areas and associated retention dykes and later a treatment facility. The ETMA tailings areas contain approximately 22 million tonnes of material over a 250 hectare area (TetrES, 2006). In addition a portion of the site was used as a municipal waste disposal site. The tailings areas now comprise the most important elements of the closed site and are identified as the East Tailings Management Area (ETMA) and West Tailings Management Area (WTMA).

Based on the Dillon study (2003) Manitoba Mines Branch was directed to develop an implementation plan to remediate the mine site mill and tailings areas. During the conduct of the risk assessment and the development of the implementation plan, regular meetings were held with the Town and First Nations representatives. In the later stages, separate meetings with First Nations and the Town were held due to issues arising between the parties. The First Nations also agreed that one band would represent the interests of both First Nations communities. While there were criticisms of the risk assessment evaluation the report provides a science based evaluation of the area impacts.

Coincident with this activity, under the terms of a 2001 Memorandum of Understanding (MOU), the Province and Viridian Inc., in partnership, carried out a number of studies of the ETMA that were used in the final rehabilitation plan. While BHK was originally involved with the WTMA, under a separate agreement, the Province assumed liability for the WTMA and mill site at about the time of the Dillon study. The Province retained consultants to provide project management and implemented various rehabilitation measures that included:

- demolition of the headframe complex,
- demolition of the mill site and buildings,
- demolition of the loadout,
- review of water management and treatment options, and
- development of remediation plans for the mill area and loadout.

In addition the Town waste disposal site was decommissioned and a new site constructed.

In accordance with the MOU (2001), the Province and Viridian entered into a formal agreement (2006) to equally share the cost of rehabilitation of the ETMA with a plan to
be developed and agreed to by all parties. By amendment of the Agreement in 2009 the parties considered the WTMA and ETMA as one site for remediation.

The remediation plan was based significantly on the joint studies completed between 2001 and 2006. These studies involved rigorous sampling and analysis of surface and groundwater, flow path identification, river modeling, dyke stability, and lead to the establishment of site-specific contaminant concentrations.

The objectives of the Rehabilitation Plan are to provide a plan for the rehabilitation of the surface elements that remain at the site and does not address any underground infrastructure that may have been associated with the operation of the former mine.

The measures to be implemented are expected to result in measurable improvements in surface water quality once fully installed; however the full process of site restoration of water quality may be a lengthy process. To support the water quality improvements, site-specific risk-based concentration targets were to be developed and used as the long-term goals for water quality. While the site-specific standards were still under development, preliminary evaluation of the use of Water Effect Ratios (two variants) as specified in guidance provided by the Canadian Council of Ministers of the Environment (CCME) are used to establish interim numbers for metals concentrations and total organic carbon using existing geochemical data for site surface water. Once the full program of testing and computations needed to finalize site-specific standards based on the Water Effect Ratio method has been completed, the document is to be amended to include the final site-specific target levels. Those levels will then be treated as long-term Water Quality Objectives (WQOs).

The overall approach to rehabilitation of the Farley ETMA site consists of consolidating fringe and outlying deposits of tailings and waste rock into a centralized location and capping with multi-component covers.

Specific measures planned and implemented (with the exception of completion of capping in 2013) at the Farley TMAs include the following:

- Consolidation of the identified thin fringe tailings deposits from the perimeter of the tailings management area and other areas at the site that have a thin veneer of tailings materials, as well as waste rock and other identified impacted soils, to the tailings consolidation pile;
- Capping of consolidated tailings, as necessary, with engineered or vegetative covers;
- Minimization of surface water run-on to the TMAs through diversion measures (such as the North Diversion Ditch) and constructing engineered drainages for clean run-off;
- Capping of remaining waste rock and tailings materials in the WTMA with engineered and/or vegetative covers in areas where fused materials prevented their consolidation to the impoundment;
- Temporary operation of a mechanized water treatment plant as necessary until the coarse tailings cover is substantially completed and the water quality has
improved to the point that treatment is no longer required to manage surface water run-off;

- Drainage and closure (through backfilling or regrading) of High Pond and Sherritt Pond;
- Dredging of lime sludge from Finger and Mid Ponds to provide capacity for future water treatment, as needed; and
- Up to five years of post-completion monitoring, including monitoring of the engineered covers, the dykes and surface water.

Water quality is currently impacted in most areas on-site due to contact with and run-off from acid generating materials, and is the primary source of ARD-related (Acid Rock Drainage) impacts to the Lynn River. The primary impacts to surface waters are lowered pH, dissolved and suspended metals (particularly aluminum, copper, cobalt, nickel, and zinc), and elevated sulphate concentrations. As noted prior, detailed studies delineated surface water pathways, drainage areas, and run-off volumes and surface water impacts. These studies showed that two main drainage discharge pathways impacted surface waters from the site to the Lynn River. Pathway 1 is also known as the Transmission Line (T-Line) drainage, where surface water from the west side of the ETMA drains to the south. Pathway 2 is the main surface of the ETMA and discharged to the Lynn River through the Dyke 5 Culvert. In addition, it was concluded that the surface water pathway along the T-Line drainage accounted for the majority of metals loading to the Lynn River, while the loading contributions at Dyke 5 were relatively small (TetrES 2006).

In addition to the drainage pathways, several surface water impoundments remain on site (see Figure 13 for locations). A number of these impoundments (referred to as ponds) have been incorporated into the water treatment system, including North Pond and Reclaim Pond, which are used as collection basins for the water treatment system. Once treated, the water is discharged to the Finger, Mid, and South Pond impoundments, where lime sludge settles before the treated water discharges through a leaky dyke to the Lynn River. Other impoundments on site include High Pond, which has historically been a source of acidity and has been drained and partially filled; Sherritt Pond, which contains some of the most heavily impacted water at the site; and Cutoff Pond (also known historically as Pond 6), which is located outside the dyked portion of the site. Additional precipitation-fed small catchment basins have also developed behind the dyked portion of the ETMA. Surface water drainage at the site was altered significantly during the 2010 rehabilitation activities, in addition to draining High Pond (via the west drainage ditch). Surface water is now prevented from flowing down Pathway 1 to the Lynn River by interceptor trenches that route the water to North and Reclaim Ponds for treatment. Finally, clean surface run-on water is routed around the site to the east by the North Diversion Ditch.

Groundwater was not identified as a contributor to discharges and therefore does not require mitigation.

In summary, the primary environmental impacts at the site are the result of ARD generation and impacted surface water run-off. To mitigate impacts from ARD generation, the following measures were planned:
• Consolidate identified tailings to the main consolidation pile. Cap the coarse tailings consolidation pile using an engineered impermeable cover.
• Cap intermediate and fine tailings with an engineered semi-permeable cover as necessary.
• Reinforce existing dykes on impoundment to provide long-term stability and containment.
• Revegetate selected areas as needed.
• Divert clean surface water around the site.
• Cap remaining waste rock and tailings in the WTMA in the areas where fused materials prevented the consolidation of these materials to the main consolidation pile.
• Temporarily treat surface water exiting the WTMA portion of the site until surface sources of ARD have been isolated and/or capped (after which water quality is expected to improve).
• Fill and close Sherritt Pond and incorporate portion of drained and backfilled High Pond footprint into the coarse tailings cover area. Dredge lime sludge from Finger and Mid Ponds to provide future capacity for additional water treatment as needed.
• Develop a plan for post-completion monitoring of the consolidated tailings covers, dyke stability and surface water quality to assess the integrity of the rehabilitation measures and the effectiveness of the remedy.

At this time, the majority of measures have been implemented with completion of cover expected in 2013. Costs estimated to complete the rehabilitation measures were $62.9 million. While further water treatment may not be necessary, the existing plant remains operational.

First Nation / Town of Lynn Lake Involvement (stakeholders)¹

During the development of the Human Health and Environmental Risk Assessment Report regular meetings were held with both the First Nation and the Town of Lynn Lake. These meetings were joint meetings involving representatives of both the First Nation and the town. The consultant outlined the process; discussed options for remediation and issues with the stakeholders and comments were incorporated into the report.

Based on the report, Mines Branch was charged with developing an implementation plan for remediation of the WTMA, ETMA and Mill sites. In developing the scope, consultants were retained by Manitoba Mines Branch to provide project management services for the WTMA, the services included engineering and implementation of the agreed upon remediation measures. During this period regular meetings were held with stakeholders, however due to issues arising between Town representatives and the First Nations, separate meetings to review scope and solicit comments were held with each group.

¹ Much of the information on stakeholder involvement throughout this case study was provided by E. Armitt, Retired Director, Manitoba Mines Branch
At one meeting the chiefs of both the Mathias Colomb Cree Nation and Marcel Colomb First Nation were in attendance, and it was agreed between both Chiefs that the Chief of Marcel Colomb First Nation would represent the interests of both Bands. Meetings were held with Chiefs and Council and also with the community. As the Band office was located opposite the Town Hall in Lynn Lake, all meetings took place in Lynn Lake.

As mentioned prior, separate discussions took place between the Province and BHK with regards to liability for the remediation of the WTMA and Mill site and the continuing water treatment. An agreement was made between the Province and the company whereby for a lump sum payment the Province assumed liability for the WTMA and Mill site.

The ETMA remediation was also taking place at a much slower pace with the private company owning liability for the site completing studies to determine the best approach for remediation. In 2009 an addendum to the 2006 Agreement was signed between the Province and Viridian, whereby the WTMA and ETMA were to be considered as one site for remediation. Once again, separate meetings were held with First Nations and Town Council on a regular basis. At least twice a year community meetings were held with both groups.

The consultant retained by Viridian was responsible for developing the scope of the remediation and implementing the work. The First Nations were totally engaged in the process and an agreement with First Nation was put in place known as “the Elders Program” whereby an elder with the Marcel Colomb First Nation was retained to counsel the Band members who were retained by the contractors.

One of the benefits arising from the remediation work was the formation of the Marcel Colomb Development Corporation (owned by the Band). The MCDC operated the construction camp and also provided manpower for the projects. An extensive training program was also established for First Nation people and local residents.

In the fall of 2012 an agreement was reached with Viridian/Agrium whereby the Province assumed all responsibility for the ETMA.

The engagement of the First Nations in the project was extremely challenging due to many factors. However with the remediation work over 90% complete and the Province taking full responsibility for the land and any further issues, the way forward for relations with the First Nations looks positive. The Marcel Colomb First Nation have been full participants in the process and it is anticipated that relationships with the Town will improve over time. It was a steep learning curve for all concerned.

**Viridian/Manitoba Partnership**

Responsibility for the ETMA site was a matter of some discussion over the years as the site had been “abandoned” for many years and perhaps due to the fact that the tailings were deposited by different operators from other sources. In 2001 Viridian and Manitoba entered into a Memorandum of Understanding to carry out studies and develop a rehabilitation plan for the ETMA site. Details of this MOU have not been made available.
to the authors of this study. In 2006 the MOU evolved into an agreement to rehabilitate the ETMA on a 50/50 cost-sharing basis. Though an executed version of this agreement was also not available, key elements included:

- 50/50 cost sharing for development and implementation of the Rehabilitation Plan.
- Emergency response measures.
- Confidentiality clauses.
- Dispute resolution processes including negotiation, mediation, arbitration as necessary.
- Non-admission of liability.
- Exclusive use of site clause.
- Indemnification of Viridian Inc. and Agrium Inc. and their successors/predecessors against past, present and future claims except in the event of the commitment of a material event of default.

Release from Liability
In 2012 pursuant to an “Executive Approval” by the Manitoba Government, Agrium Inc. was released from future liability for the ETMA site. The details of this approval have not been published by the Manitoba Government. However, the Agrium Annual Report for 2012, p.79 states that they “received a release and indemnification from MMB to the full extent permissible under Canadian law in exchange for the completion of certain remediation work at the site before 2013 and the payment of a lump sum of under $10-million to MMB.” [link]

This money is to be held in the Mine Rehabilitation Fund established under the Mining Act that would fund future activities including funding a five year monitoring program.

Transparency
As described in previous sections the Manitoba government extensively involved the community and First Nation members in meetings and discussions regarding the rehabilitation of the East Tailings Management Area. As well, press releases regarding the site rehabilitation program were published and a website was established and continues to be maintained. However, the contents of executed documents including the 2001 MOU, the 2006 Agreement and the 2012 Executive Approval for providing the liability release and indemnification of the ETMA tailings area have not been made public. Further, there has been no announcement, no press release and no publicity whatsoever on this important and interesting process; thus, one may conclude that the Manitoba Government has been less than transparent on this matter which is unfortunate as the process has the appearance of being well thought out and well managed. There is no documented evidence that either the local community or the affected First Nations seem concerned by this lack of transparency.

Discussion
This case study is focused on the Farley East Tailings Management Area as that is the subject area of the “release and indemnification” by the Manitoba Government in December 2012. Though this process is not the result of a legislated process it follows a
logical step-wise progression that might be expected for abandoned works which predate legislated Closure Plan Requirements for mine development as follows:

- Inventory and identification/prioritization of major issues.
- Engagement of owners by Manitoba Mines Branch.
- Establishment of a Technical Advisory Committee to gather community and technical input.
- Human Health and Environmental Risk Assessment.
- Involvement of primary stakeholders in process.
- Development of rehabilitation plan.
- Execution of rehabilitation plan.
- Payment to Crown of estimated future costs.
- Acceptance of liability and provision of indemnification.

Though no financial information has been made available, we assume that the sum provided to the Manitoba Government was based upon sound technical estimating and extensive negotiation. The process described above indicates to proponents that there are circumstances where the Manitoba Government is willing to accept lands back, provide relief from liability and indemnify the proponent against future actions. However, since there is no legislatively defined process, proponents have no guarantee that this pathway is available to them.

Some other important spin-offs from the overall process include:

- Formation of a Community Adjustments Committee (CAC) to look at economic development opportunities for a single resource town.
- Fundamental to the Human Health and Environmental Risk Assessment project was a four phase communications and consultation program from September 2001 to April 2003 consisting of a series of consultation meetings and open houses with the CAC, general public, Marcel Colomb First Nation, and Lynn Lake Town Council. Two Community Updates were delivered to all community post boxes. Open House “storyboards” were prepared and made available. A newsletter highlighting the risk assessment was delivered to all post boxes in April 2003.
- Establishment of “the Elders Program” as a best practice whereby an elder with the Marcel Colomb First Nation was retained by the consultant to Viridian to counsel the Band members who were retained by the contractors.

Conclusion
Rehabilitation and release from liability of the Farley East Tailings Management Area represents a significant amount of cooperation, diligence and expenditure by Manitoba Mines Branch and Agrium Inc. However, because the process was not fully transparent, questions remain about how the agreement was reached and how available such agreements may be to other proponents. From a positive perspective, this process provides a precedent with respect to return of mining lands and the extremely important issue of future indemnity. On the other hand, it does not provide certainty that this would be repeated for other similar situations.
LESSONS LEARNED FROM THE CASE STUDIES

The following notes reflect some lessons learned respecting procedures for relinquishment of lands to the Crown. They are based on issues encountered during the production of the foregoing case studies and from the reports by Cowan et al. (2010) and Tunis (2011).

1. Wherever possible the “one window” approach has been found to be beneficial. MOU’s between regulatory agencies clarifying their roles in such matters are very useful.

2. Jurisdictions must have clear and well-written legislation and policies in place to facilitate the return of lands. It is necessary to have a system to receive and manage funds to ensure viability needed to address long-term issues.

3. Where planning and procedures for relinquishment are not in place, defaulting will eventually occur at taxpayers’ expense. This can occur in several ways including forfeiture of corporate charters and seizure by municipalities for unpaid taxes.

4. Public consultation requirements/efforts are generally considered inadequate relative to current expectations, especially with regard to Aboriginal Canadian communities. The mines reviewed for this project came into production prior to comprehensive consultation becoming either an expected practice or mandated by government. Consultation with community and First Nation Stakeholders in the Lynn Lake area of Manitoba was well planned and carried out with regard to the Farley East Tailings Management Area Consultation requires good information on the issues and needs of impacted communities.

5. Few jurisdictions have a satisfactory funding regimen in place to deal with surrendered, or about to be surrendered lands.

6. Most jurisdictions providing for rehabilitation releases and/or relinquishment of lands do not have complete releases for environmental responsibility or liability.

7. It appears that only some jurisdictions have institutional control plans for relinquished lands, i.e. there is no administrative unit with direct responsibility for institutional issues following surrender, e.g. records maintenance, land use planning inputs.

8. Third party involvement by concerned special interest groups and others is becoming common; there is a lack of perceived government credibility.

9. Lack of capacity by stakeholders often hinders their ability to be effective.

2 The term Aboriginal is defined in s.35 of the Constitutional Act as including Indian, Inuit and Métis Peoples.
10. Long-term geochemical issues are not always fully understood.

11. The length of post-closure monitoring periods needs greater evaluation especially where documentation/identification of features is lacking.

12. Well-defined risk assessment procedures for property returns are not available for many situations. More information on quantitative risk assessment is required to support chemical and physical stability determinations.

13. It appears that many technical assessments are accepted at face value and that peer review by Qualified Persons is not commonly used. Peer review was used in the review of the Human Health and Environmental Risk Assessment at Lynn Lake Manitoba.

14. Where cutting edge technology is involved, longer term monitoring and scientific assessment may be expected, e.g. new schemes related to permafrost or climate change issues.

15. Lack of confidence by non-technical bureaucrats with respect to technical reviews and risk assessments.

16. Long-term inspection regimens are required to monitor and repair disturbances to rehabilitation works through natural or man-made activities, e.g. vandalism.

17. Effective cost-estimation procedures for long-term care and maintenance need development.

18. Storage and maintenance of mine plans and records are essential for technical assessment. Several of our case studies were hindered by the loss of or unavailability of documentation.

19. Provision of a final closure report detailing all completed decommissioning and reclamation work is an excellent best practice.

20. Appeal procedures are not present in all jurisdictions. One example, the Manitoba/Agrium draft agreement, demonstrated a well thought out dispute resolution sequence.

21. Some decision makers lack confidence in making decisions leading to deferral.

22. Evolving standards, e.g. water chemistry, causes uncertainty and delays.

23. There is no protocol for the public to inform jurisdictions of observed reclamation issues.

24. In instances where bi-lateral negotiations are being carried to provide for ‘special case” agreements, transparency may be lacking.
A DECISION MAKING PROCESS FOR RELINQUISHMENT

Introduction

As stated earlier in this report, a principal recommendation of Cowan et al. (2010) was that “jurisdictions should have a managed relinquishment process, which is clear and unfettered and is specific about what will not be accepted. Hitherto closure plans have been prepared on a “design for closure” basis. It is suggested that a more forward-looking approach be embraced and that a “design for relinquishment” approach be adopted”. It is not intended that relinquishment be the only option but rather that it be an important option or objective because of its role in protecting the public from the inadvertent accumulation of abandoned mine environmental and financial risks.

A NOAMI Task Group identified the need to develop further materials that would examine specific case studies and use the sum of information collected to establish a decision matrix (or tree) that would “outline the key factors that need to be assessed in determining if a site should be brought under government jurisdiction or remain the responsibility of the operator.” Factors to be considered included those listed below:

- Environmental and financial risk
- Liability
- Sustainability
- Capital replacement
- Fund management, including the equivalent treatment for all sites, and separation from general revenue
- Open and transparent accountability and audit-ability

<table>
<thead>
<tr>
<th>Environmental and financial risk</th>
<th>Political will</th>
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<tbody>
<tr>
<td>Liability</td>
<td>Government will and capacity</td>
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<tr>
<td>Sustainability</td>
<td>Environmental engineering</td>
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<td>Capital replacement</td>
<td>Stakeholder engagement</td>
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<td>Fund management, including the equivalent treatment for all sites, and separation from general revenue</td>
<td>Data management</td>
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<td>Open and transparent accountability and audit-ability</td>
<td>Dispute resolution</td>
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<td>Oversight</td>
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<td>Transferability of ownership and liability</td>
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Relinquishment in its simplest form would include fully reclaimed sites which are chemically and physically stable, requiring little or no further monitoring, care or maintenance. An example of this might be a small open pit that is backfilled according to engineering standards. These may be taken back by the jurisdiction involved with no absolute liability attached. At this time Ontario is the only Canadian jurisdiction that has a provision to do this. Several jurisdictions have provisions to accept such properties with the caveat that future liability remains.

A less complete form of relinquishment would include reclaimed sites that have ongoing needs for monitoring, care or maintenance. These future needs would be fully funded by the proponent and managed through some form of institutional care provided for by the jurisdiction. Again, Ontario has the only provision for accepting such lands without future liability; Saskatchewan regulations provide for accepting such lands but liability for future eventualities remains (see Case Study for Contact Lake Mine).

Relinquishment is generally not a consideration for properties where risks or uncertainties are too high or where there are specific no-go requirements such as the need for a water treatment plant. However, in the instance of the Farley ETMA, the water
treatment plant remains in a functional condition. It will be removed following further monitoring at the site and demonstration that the plant is no longer needed.

Ideally the return of mining lands to the Crown (relinquishment) following mining benefits both parties. Firstly, a relinquishment program that fully funds future needs to manage the site ensures that the public is protected from risks, which may arise with time that the original proponent may or may not be available or able to remedy. Further, the relinquished lands are available for further mineral exploration purposes or other land uses deemed appropriate by the jurisdiction.

Secondly, relinquishment benefits the proponent as they are relieved from future management of the site (at their cost); they are able to put their efforts into their primary endeavour - mineral exploration and development; and, importantly, the proponent is no longer required to show financial liability for the site in their corporate financial reporting.

Necessarily, where the financing cost for the future management of the site is very high, or the financial risks and uncertainties cannot be quantified to the satisfaction of the jurisdiction, the process of relinquishment will not proceed and the proponent will continue as tenant and operator indefinitely. In this instance, if the proponent is not financially strong, the risks to the jurisdiction may increase, including monitoring, maintenance and unforeseen events expenditures. The risk increases in a direct proportion with time. Further complications may involve sale of properties to “non-local” interests who could conceivably retreat to foreign shores.

This chapter will focus on the creation of a decision making process for relinquishment making use of the six case histories, information found in Cowan et al. 2010 and Tunis 2011, and the collective experience of the authors. The approach to a decision making process has been influenced by the work of Roberto (2005, 2009) who, through numerous case studies, makes convincing arguments for breaking complex decision making situations into more manageable “bite-size” steps.

We will first examine three types of challenges faced in the making of a decision to issue (or not to issue) a release certificate. This will be followed by presentation and discussion of a five step decision making process.

**Process Challenges**

Jurisdictions working through the closure/rehabilitation process commonly involve a number of departments, each with differing mandates. In some cases a “one window” approach is used where one department serves as team leader. It is recommended that jurisdictions utilize a one-window approach for their post-closure relinquishment process.

Roberto (2009) points to three modes of failure (Technical, Cognitive and Interpersonal) that can impede or prevent a successful decision. He states: “These problems may entail breakdowns in technical, cognitive, and/or interpersonal nature. Technical problems consist of breakdown in the functioning of equipment, technology, natural systems, and
the like. Cognitive problems entail judgment or analytical errors on the part of individuals or groups. Interpersonal problems involve breakdowns in communication, information transfer, knowledge sharing, and conflict resolution.” This chapter will outline a decision making process that attempts to take into account and avoid these three modes of failure.

Technical
The technical factors in making a relinquishment decision are complex and diverse. For example, input is required by a number of specialists on matters of finance, environmental engineering, biology, geochemistry, and land use planning, to name a few.

When developing a strategy it is important to keep in mind the “intended use of the land” after relinquishment. It is quite possible that new land-use pressures may differ from that proposed in the original mine closure plan, especially for mines that have been in existence for a great number of years. This could have an impact on many of the technical factors. It is prudent to make sure the land being returned to the Crown has been reclaimed to conditions that suit the intended use after relinquishment and are not compromised by future land use proposals.

Care should be exercised by individual specialists to make sure the technical issues are understood by other committee members.

Cognitive
There are a great many factors that have to be dealt with in the relinquishment decision making process. Committee members may find themselves confronted with information overload and because of this be unable to play a meaningful role in the decision making process. Figure 14 outlines a number of factors that may come into play. The only purpose of this cluster diagram is to illustrate and serve as an example of some of the great number of different issues an administrator may have to consider when faced with a relinquishment decision. It is intended to help demonstrate to the reader that a decision making process may be the best way to deal with an apparently overwhelming set of factors. Each jurisdiction will have its own set of factors to be considered.

As discussed by Roberto (2005), there are bounds to cognitive thinking. Most individuals are used to dealing with limited data sets. However, the complexity of relinquishment decisions, especially when several government departments and external groups are involved, can result in information overload and hence be an impediment to cognitive thinking. It emphasizes the need for experienced professionals to formulate and evaluate an effective program as well as educate where necessary. An approach where issues are bundled into small parts (or steps) can greatly improve the cognitive process.
FIGURE 14 - Cluster diagram showing some of the many factors to consider in making a relinquishment decision.

Interpersonal
Most jurisdictions have separate departments or ministries to look after the environment and mineral resources. In some cases water resources are split off from the environment department, industrial minerals are separate from the metallic mineral resources, etc. Relinquishment review committees can thus end up with a number of representatives from different departments, each with separate mandates. Committee members may not know each other very well or may not be comfortable working outside of their own specialty. This could have an impact on group dynamics. On the other hand a committee
where members are at ease with each other and willing to debate and share information is
a committee more likely to connect the dots. While the subject of group dynamics is
beyond the mandate of this report, a small-step decision making process may greatly
improve understanding, knowledge transfer, and provide focus for conflict resolution.

Creating a “Decision Making Process”
It is important that a committee discovers, debates and resolves issues in a systematic
manner prior to making a relinquishment decision. In other words, follow a process
where a committee can proceed using a series of small wins as illustrated by Roberto
(2005) in several case history examples of “step by step” approaches where committees
were able to secure commitment and reach closure.

A Five-Step Decision Making Process for Relinquishment
A Five-Step decision making process has been created following the natural progression
from “Submitting the Application” through to “Implementation” (Figure 15). For each
step, consensus must be reached by the review committee prior to moving to the
succeeding step, i.e., before proceeding from one step to the next, all “yes” components
must be met. Figures 16 to 20 detail the five steps using a “decision tree” format.
Descriptive notes accompany each of the steps. It is suggested that an appeal process be
available through every step.
FIGURE 15: A FIVE-STEP DECISION MAKING PROCESS FOR RELINQUISHMENT

Step 1: Submitting the Application

Under what authority?
Under what circumstances?
Who should be notified?

Step 2: Site Assessment

Where is the site?
What is the condition of the site?
Future use of the land?

Step 3: The Long-Term

What are the routine needs and costs?
What are the major costs?
What risks exist?
Is there an appeal mechanism?

Step 4: Funding

What funding mechanisms are in place?
Are special purpose accounts in place?
Is there an appeal mechanism?

Step 5: Implementation

Is an administrative agency in place?
What are the routine tasks?
How can emergencies be handled?
FIGURE 16 - STEP 1: SUBMITTING THE APPLICATION

1.1 - Authority:
Is there an applicable statute/policy/protocol?
Is there a mandated lead government agency?
Has a qualified proponent submitted a request?
Is there a “grandfather” clause process?
Is there an appeals process in place?

If yes

If no

Return application.

1.2 - Circumstances:
Is the closure plan (CP) fully implemented and objectives met? No outstanding issues with CP?
Are the locations of site and site features well documented?
No outstanding issues with a “grandfather process”? CP intended land use has not changed?

If yes

If no

Return application for modification or clarification.

1.3 - Notification:
Is there a mandated protocol?
Are stakeholders included?
Are Aboriginal Canadians included?
Are other jurisdictions included?
Are other government agencies included?

If yes

Complete notice requirements and proceed to Step 2 – Site Assessment.

If no

Create mandated protocol and identify all stakeholder communities.
Step 1 – Submitting the application (Figure 16).

Upon completion of a mining project the proponent may wish to return the affected mining lands to the jurisdiction where it has the necessary legal and policy elements in place and the project is eligible. An application to do this to do this requires the following:

- Statutory authority to apply to surrender or return the mining lands to the jurisdiction through an identified lead agency (where statutory authority is not specified then a suitably approved policy such as an approved grandfathering process may be applicable).
- Authorized proponent representative must submit application and certify the following:
  1. closure objectives have been met
  2. the approved Closure Plan has been fully implemented
  3. the site is physically and chemically stable
  4. there are no ineligible components; for instance, some jurisdictions will not accept projects requiring ongoing water treatment.
- Financial assurance requirements associated with the site have been met.
- All permit requirements have been fulfilled or are transferable to the jurisdiction.

In situations where the site may have been operating and/or closed out prior to statutory requirements for closure plans and the site is not operating under an approved closure plan, the proposed surrender may have to be handled through properly authorized policies or special legislative instruments, e.g., Order-In-Council, or, as in the case of the Farley ETMA site, Executive Approval. Such a policy provides an indication of political will and direction to the regulators and provides a degree of certainty to the owner. Such a process, however, can be very onerous from an administrative point of view and is often lengthy as well as subject to change for each application, depending upon political direction.

The jurisdiction must confirm that the reclaimed site conforms with closure plan objectives and is consistent with existing surrounding land use plans and that documentation exists that provides accurate location of the site and all relevant features.

Legally required and discretionary public notification and communication plans must be developed and implemented by the proponent for community stakeholders, Aboriginal stakeholders, other government agencies and other potentially impacted parties. The lead agency for the review process may also have inherent notification and communication requirements.
2.1 - Location and tenure:
Map of location available?
Coordinates of features available?
Is current application consistent with land tenure? Site documents?

- If yes
- If no

Proponent asked to supply relevant information.

2.2 - Final audit:
Regulator site audit & review confirms work completed in CP?
QP review finds no issues?

- If yes
- If no

Process stopped until proponent satisfactorily rectifies all issues.

2.3 – Post Audit
No interim monitoring/or extra work identified?
No appeal requested?

- If yes
- If no

Proponent establishes interim monitoring schedule and completes required work.

2.4 - Use of the land:
Is site suitable for intended use?
Do sufficient land use controls exist?
Stakeholder and Aboriginal Canadian input?

- If yes
- If no

Proceed to Step 3 The Long-Term
Action taken to produce acceptable conditions.
Step 2 - Site Assessment (Figure 17)

Step 2 is portrayed in Figure 17 and sets out the locational and technical issues that must be assessed to determine if the site is reclaimed to a state that meets the requirements of the legislation under which the closure plan was developed and that it meets proposed future land use requirements. As well, this information is required to establish future land use controls for the site, where required.

Requirements for this assessment by the Regulator may include:

- Accurate maps and documentation of the mining property being surrendered that provide location and detailed coordinates for all remaining mining related features that may impact on future land uses; for example: covered mine shafts, crown pillars, raises or stopes, tailings storage facilities and related management structures.
- Provision for future access to features that may need monitoring and maintenance.
- Determination of what future monitoring, maintenance or long term care may be required for water quality, physical stability and revegetation. These determinations should be based on risk assessment. In some instances, for the simplest of sites, further monitoring may not be deemed necessary. An example of such a site would be a small open pit operation where the pit has been backfilled and contoured and acid mine drainage is not an issue. Generally the majority of sites will require some degree of oversight, ranging from visual inspection to periodic geotechnical and/or surface and groundwater evaluation.

Issues related to the intended future use of the land include:

- Are Aboriginal Canadian interest groups, stakeholders, government agencies, etc., assured that the reclamation of the site is sufficient to meet the requirements for future land uses provided for in the closure objectives?
- Does the regulator have sufficient land use controls to ensure that incompatible land uses will not be used on the site in the future?
FIGURE 18 – STEP 3: THE LONG-TERM

3.1 - Standard procedures:
Have routine long-term care and maintenance issues been determined? Have costs been estimated? Have stakeholder and Aboriginal concerns been considered?

If yes

If no

Proponent directed to develop long-term care/maintenance program. Estimate costs.

3.2 - Unforeseen events:
Has a peer reviewed QP risk assessment been completed? Have costs been estimated? Is there no potential for future public health, safety and environmental issues? Have stakeholder and Aboriginal Canadian concerns been considered?

If yes

If no

Proponent directed to undertake a QP risk assessment. Estimate costs.

3.3 - Appeals:
Does appeal process address long-term issues?

If yes

Proceed to Step 4 Funding.

If no

Establish an appeals process for long-term risk assessment.
Step 3 – The Long-Term (Figure 18)
Following confirmation that the project site closure requirements have been fulfilled, the long-term potential conditions must be examined closely. Those elements of the site that may require long-term or perpetual care should be identified and fully discussed in any surrender application if not done under the closure plan itself.

The features that commonly lead to future issues include:

- Tailings facilities that are contained by engineered structures and covers designed to preclude acid generation and discharge of metallic contaminants. As a minimum an inspection program is required to ensure cover integrity and stability of dams and spillways from both human and natural intrusion. Maintenance however must also be considered to ensure spillways are not impeded and that deep-rooted tree species do not affect designed covers and containment structures.

- Pit wall stability may be considered, particularly where flooding is the closure option and will require time to reach predicted elevation. Where fencing and signage are involved, a perennial program of inspection and replacement is a minimum.

- Shaft caps require inspection and maintenance. Engineered caps, while designed for long-term, still have a finite lifetime and will fail eventually. If no replacement program is established, hazards will occur. While inspection frequency may be reduced over time, it is an essential long-range component.

- Crown pillar stability for underground operations is a challenge. While the predictive science is good, it is not infallible and monitoring after closure is principally related to observations of surface elevations to determine if subsidence is an issue. Where sites are remote some settlement or collapse may be an acceptable outcome but in areas where surface structures or transportation corridors may be impacted, this may create a significant safety issue requiring robust monitoring programs.

- Long-term treatment facilities for control of acid mine drainage present one of the most challenging situations from a regulatory perspective. There is a significant risk for capital replacement as well as ongoing operations and maintenance costs, and a number of jurisdictions will not entertain surrender of lands under those circumstances. In that situation, consideration could be given to partial surrender of the site.

While the above features are the primary areas normally expected to require long-term or perpetual care, each site may have unique features that require some degree of due diligence over time. Risks assessment by qualified persons (QP) are required for any engineered structures and any structures or features that may be subject to future deterioration or human interference; for example, security and replacement of shaft caps or maintenance of vegetation covers of tailings subject to wind erosion and dusting problems. Peer review by QPs may be required for some features or projected monitoring or maintenance requirements such as time frames for monitoring. The risk assessment should evaluate each feature from the point of view of public health and safety and environmental impact in the event of failure and estimate costs to address the issue. Potential future cost estimates should recognize a jurisdiction’s risk tolerance. Such a risk tolerance must be weighed against the economic development benefits gained from mining operations. The risk assessment method should be fully transparent and address stakeholder/Aboriginal Canadians concerns, but also recognize fairness to a proponent. Because this step may have considerable financial ramifications, an appeal process could be established for proponents.
FIGURE 19 – STEP 4: FUNDING

4.1 - Source of funding:
Is there a prescribed mechanism in place to obtain sufficient funding from proponent?
Is there a special purpose account?
Is there is an appeals process for funding issues?

4.2 - Routine costs:
Is funding in place for long-term site monitoring and inspections?
Is funding in place for long-term care and maintenance, including capital expenditures?
Is funding in place for administration?

4.3 - Major costs:
Is there funding in place to cover capital costs for remediation of unforeseen events?

If yes

If no

Government to establish a prescribed proponent funding mechanism, special purpose account and an appeals process.

If yes

If no

Government to establish a fund to handle routine long-term care and maintenance program for sites.

If yes

Proceed to Step 5 “Implementation”

If no

Government to establish a special capital cost fund for remediation of unforeseen events.
Step 4 – Funding (Figure 19)

During development, operation and closure of a mining project most jurisdictions require mining proponents to file mine closure plans supported by financial assurance (financial security) prior to commencing mining operations. This may vary from 100 percent funding required up front to predetermined percentages to be filed over time. The purpose of this funding is to cover the cost of decommissioning and reclamation once the mine has ceased operation. The nature of the funding can vary from cash to corporate guarantees depending on the jurisdictions aversion to risk and the nature and economic role of mining in the jurisdiction.

As the completion of the extraction phase of mining and related rehabilitation approaches, post-closure funding requirements come into focus with regard to environmental monitoring, inspection and maintenance of physical structures, long-term care and treatment of effluents and other costs. These activities may require funding for several years or for longer periods extending into perpetuity. For jurisdictions that provide for relinquishment, funding requirements may be broken into several elements for management purposes. For example, Saskatchewan requires funding for the following, when relinquishment is being considered (see case study for Contact Lake Mine):

- The Institutional Control Monitoring and Maintenance Fund (ICMMF)
- Institutional Control Unforeseen Events Fund (ICUEF)
- “maximum potential failure event” financial assurance
- Registration fee

In general, funding to be provided by the proponent in a relinquishment process includes routine monitoring such as water quality; maintenance of unforeseen events such as breaches in water management structures during severe storms; projected maximum failure events such as a crown pillar collapse; and funding of the administration and operational unit required to manage the above. In addition to these, where operational components may require replacement with time (treatment plants or components thereof, tailings management structures, or surface cappings of shallow stopes), additional funding (payable in advance by the proponent) for future capital costs may be necessary.

Funding estimates for the long-term must be based upon forward costing of routine activities such as fence inspection and replacement, water monitoring over several years (perhaps perpetual), maintenance or replacement of physical structures over time and in some cases capital for replacement of operational facilities that are no longer functional. Estimates for forward costing of these expenditures must include risk assessment, estimates of time required, inflation, cost of living, discount interest rates and other factors. In addition to estimates for routine predicted activities, allowance must be made for unforeseen events. Funding for unforeseen events can be handled by contingency add-ons to the forecasted costs. These monies must be posted up-front by the proponent in the form of cash or cash equivalent and the discount interest rate used must be real so that the funds can appreciate at a predictable rate in order to cover the time-frame intended. As long as the proponent is responsible for the site, the funds must be held in a special purpose account wherein the funds for a specific project can be identified. With respect to
the complexities and potential costs, it is recommended that jurisdictions consider the establishment of an appeal process.

Where jurisdictions are willing to manage certain funded liabilities through the provision of institutional care for relinquished mining properties, there is no particular need to segregate the funds by project as the funds are all held by the jurisdiction for expenditures for liabilities it has assumed. However, the funds do need to be held in a special purpose account for the purposes intended. Administration and management of these funds should be carried out by a work unit that is technically competent and dedicated to managing those properties accepted for institutional care.

For sites with potential for very large funding requirements, the costs for relinquishment may be prohibitive and the proponent may elect to retain the property.
FIGURE 20 - STEP 5: IMPLEMENTATION

5.1 - Routine tasks:
Are resources available for scheduled inspections and routine site maintenance?
Are resources available for administration?
Is there secure storage for mine plans and other relevant documents?
Has the protocol for return of lands to regulatory authorities been followed?

5.2 - Emergencies
Is there authority to act?
Are exemptions required for emergency response?
Is there a list of prequalified contractors for emergencies?

5.3 - Public:
Will a notice of certificate issuance be sent to public, stakeholders and Aboriginal Canadians?
Is there a mechanism for a volunteer corps to help sustain site ecosystems?
Is there an 800 phone number for public to report issues?

If yes

Issue release certificate

If no

Government to establish a work plan to handle long term care and maintenance program for sites, and to follow protocol for issuance of release certificates.

If yes

Government to establish a protocol to handle emergencies.

If no

Government to establish a protocol for dealing with public.
Step 5 - Implementation (Figure 20)
Once the funding for potential hazards and inspection and maintenance requirements has been established and accepted and the site relinquished, it must be determined by the regulatory authorities how this work is to be achieved over time in a consistent and planned fashion. It must be determined what organizational resources are available or may be made available to administer the funds to ensure ongoing capital and operational expenses are provided over the long term. Minimum requirements include:

- Administrative staff to process and maintain documentation and administer funds.
- Staff for inspection and maintenance activities (employees or contracted parties).
- Secure information systems to capture mine plans, technical documents, locational and other pertinent data.

A dedicated work unit should be established to plan and administer the work required to manage the relinquished mining lands and the funds required for this work as provided by the proponents. It must also ensure that completed works meet regulatory standards.

While mine features that have been rehabilitated to current rigorous standards provide a significant reduction in physical and chemical impacts, there remains an element of risk over time that a failure could occur that may require an immediate response by regulatory authorities. Examples of such failures would include the failure of engineered structures containing tailings due to severe storm events or a crown pillar failure due to ground movement. A protocol should be implemented that accomplishes the following:

- Identifies lead agency and legal authority to respond.
- Provides exemptions to purchasing policies or environmental review processes for emergency response purposes.
- Provides for access to additional funding as necessary.
- Provides for pre-qualification of competent contractors.

The protocol should be transparent and subjected to public review.

Given the fact a number of closed sites will occur in remote areas or near small communities, the local inhabitants will often be the first line of defence for identification of site problems. A public notification system using an 800 phone number offers a quick and efficient method for reporting or advising of site irregularities. A volunteer community support group would also be of benefit that provides a two-way method of communication. This would provide an avenue for regulators to inform stakeholders and Aboriginal Canadians with periodic site reports or any change in site conditions. It may also provide an informal inspection process that permits prioritizing site reviews.

Application to Case Studies
The following section reviews the six case studies with regard to how the proposed decision making process has impacted/may impact on their progress toward obtaining a Reclamation Certificate (Certificate of Release) leading to relinquishment.
The Quebec Lithium Mine attempt to obtain a certificate of release initially became stalled when the revegetation program did not perform as expected or desired, partially because of third-party interference by recreational vehicles. This would have occurred during Step 2 when the regulator was assessing the site. Subsequently the proponent completed further remedial work and negotiated a new ATV trail with local cottagers (stakeholders). Upon reapplication for a Certificate of Release the regulator determined that required reclamation work was completed, that there was no risk of acid mine drainage from the tailings and that no money was due to the Ministry. A Certificate of Release was then issued. This example illustrates a somewhat indirect route in that the regulator allowed the abandonment of the leases nearly two years prior to issuing the Certificate of Release. During this time Canadian Lithium Corp. was issued mining claims for the site and is proposing to go into production in the near future – a successful transfer of exploration rights while a second party was still being held accountable.

The Renabie Mine was considered closed in accordance with the closure plan in 1996 and in 2001 application was made to return the property to the Crown. This application provided for the posting of funds for perpetual care costs. The process was interrupted by two events - the failure of a crown pillar, previously deemed to be stable, and expressions of concern by First Nation members (supported by NGO group) that environmental issues were impacting land claim negotiations and traditional uses in the area. In essence this interruption occurred during the Step 5 implementation phase due to protocols for surrender not being in place. While the regulator did attempt to establish a process through policy development, this has yet to come to fruition. The site remains in a state of abeyance with the current owner being responsible.

The Polaris Mine was decommissioned and reclaimed in 2004 followed by five years of post-closure monitoring that indicated that the site was physically and chemically stable. Though the water licence expired in 2011, the proponent retains responsibility and discussions are ongoing with respect to renewing the water licence for an extended monitoring period based on additional concerns and study by the federal regulator. In addition, neither Nunavut nor the federal regulator has any legislation or policy that addresses surrender of lands with proponent-funded long-term inspection and maintenance. Thus, although the project may be technically in a position to return the lands to the Crown at a Step 4/Step 5 level, the absence of government authority (and perhaps political will) to do so is a major impediment to the process.

The Gregg River Coal Mine, though soil cover work is considered complete, has remaining issues with respect to revegetation objectives and selenium contamination of surface drainage. Though considered to be the most advanced coal mine in Alberta with regard to returning mining lands to the Crown, it is expected that the revegetation objectives may take 10-15 years with strong commitment. Thus, in terms of the 5-Step Decision Making Process they are not in a position to apply for a site-wide Reclamation Certificate.

Contact Lake Gold Mine has returned its surface leases to the Crown and the project area has been accepted into the Saskatchewan Institutional Control Program. All regulatory
requirements have been met and all future costs to monitor and maintain the site have been funded; as well, funding has been provided for unforeseen events and financial assurance has been posted for the “maximum potential failure event.” However, absolute liability remains with the company respecting future environmental events.

Review of the case study for the Contact Lake Gold Mine demonstrates a logical progression through decommissioning and reclamation to acceptance into the Institutional Control Program in a manner not dissimilar to the decision making process under discussion herein. As suggested previously (Cowan et al. 2010), the Saskatchewan Model provides an excellent starting point for jurisdictions proposing to instigate a comprehensive program for the return of mining lands to the jurisdiction. At this juncture it is suggested that the Saskatchewan methodology for providing for funding of unforeseen events is not compelling and may not withstand the tests of time, especially for major physical structures, major water management issues and other factors. The Saskatchewan strategy involves establishing a significant pool of funds from numerous relinquished projects in order to be in a position to manage a major failure. Interim coverage is provided by financial assurance coverage of a “maximum potential failure event.”

The proponent of the Contact Lake site commissioned a final closure report detailing all completed decommissioning and reclamation work, in essence an “as-built” report of work completed. This is an extremely good practice in the mining milieu of continuously changing ownership and the concomitant loss of information and documents.

Farley East Tailings Management Area is a special case wherein the owner of the subject property was relieved of further environmental liability via an Executive Approval process of the Manitoba Government. Manitoba does not have a formalized relinquishment process and lands may return to the Crown by default or expiry of a lease; however, the former owner/occupier continues to retain responsibility for environmental liabilities. The massive sulphide ores processed created a tailings area with acid rock drainage and metal leaching issues that were treated with a variety of oxygen-excluding capping procedures, as well as a water treatment plant (WTP). It is intended that the WTP will remain in operable condition until more monitoring data is obtained. Communication strategies and the Human Health and Environmental Risk Assessment were important components of this project. The overall success of the process used will be unknown for some time.

Although the process resulted in the release and indemnification of Agrium from future liabilities, it provides an ad hoc precedent which may or may not be available to other corporations, especially the indemnification.
SUMMARY AND CONCLUSIONS

The intent of this project was to develop several case studies on the processes and practices of Canadian jurisdictions where proponents wish to return or relinquish mining lands to the Crown. Information from this exercise was to be integrated into the development of a decision tree or matrix whereby jurisdictions could develop a policy framework and regulatory program for closure of mine sites and long-term management and related liabilities in a manner that clearly sets out the responsibilities of the mine operator and government regulatory agencies. Ultimately this could be used to determine if a site is suitable to be brought under government jurisdiction or whether the site should remain the responsibility of the proponent. Each jurisdiction would have to establish a decision making process that meets their particular regulatory instruments and policies. The case studies were to be completed on projects wherein the mine is closed and the proponent was either returning the site to the Crown or making application to return the site under an established legal framework. A review of potential sites for the case studies indicated that few Canadian sites fit the criteria; thus the criteria had to be expanded to include projects that were not as far advanced in the process as was initially desired.

The case studies provide a series of circumstances respecting projects that are completed or nearly completed, where the proponent wishes or may wish to return the mining lands to the Crown. Issues contributing to creating delays in obtaining various releases for reclaimed lands include:

- revegetation performance
- failure of physical structures deemed to be stable by engineering studies
- chemical contamination through weathering of disturbed on-site rock materials; lack of scientific information for setting standards
- scientific uncertainty, especially long-term, is increasing with climatic change and technological advances
- lack of consultation with government and potentially impacted parties
- lack of policy or legislative tools available to government decision makers
- lack of objective decision making processes
- lack of political or bureaucratic confidence and/or will
- lack of technical understanding by local communities
- lack of trust with bureaucracy to address local needs, and
- limited focus or discussion of funding for post-closure needs by industry and government.

This report develops a five-step decision making process for determining whether a mining property has been closed out as per requirements and closure plan and that the proponent has addressed technical and financial long-term monitoring and maintenance needs sufficiently that the property may be considered for relinquishment to the Crown.

This process provides guidance that would assist jurisdictions in developing a policy framework and regulatory program for closure of mine sites and the long-term management of environmental, social or financial liabilities in order to determine if the site should be brought under government jurisdiction or remain the responsibility of the...
operator. Of necessity, each jurisdiction would have to refine the details of this decision making process to fit its specific regulatory environment and the economic role of mining in the jurisdiction.

In Canada many jurisdictions will not accept returned lands and provide immunity to future liability for events such as chemical contamination. While this approach would seem reasonable to most, it is suggested that options for relinquishment with immunity should be available on a reasonable risk-based future cost basis to accommodate perpetual care and maintenance. This is one solution to the concern that unmanaged mining lands with environmental, social or financial liabilities will eventually find their way back into government stewardship through default or otherwise.

The acceptance of the Contact Lake Mine into the Saskatchewan Institutional Control Program demonstrates a process of developing policy, legislation and regulatory procedures whereby a proponent may, in a step-wise manner, proceed from preliminary exploration through development, production, mine closure, mine decommissioning and reclamation, post-closure monitoring and maintenance, to relinquishment with long-term care and maintenance issues funded by the proponent. As noted earlier, acceptance into the ICP does not preclude future responsibility as absolute liability is not waived.

The majority of the cases reviewed raise the question whether the jurisdictions have a true desire at this point in time to accept relinquishment (surrender) of mining lands, except for the simplest of sites. As noted above, this is principally related to a concern for future liability in the event of unexpected failure of site features causing environmental or public safety hazards. Most jurisdictions do not have a process or legislative tools in place; in particular the authority to secure funding to provide for this possibility. Currently financial assurance is primarily related to site rehabilitation that ends with successful demonstration of completion of the closure plan process.

Local communities often do not have the capacity to completely comprehend the complex scientific and technical issues and often tend to seek third party review funded by the jurisdiction or company involved. This can often be viewed as an unwarranted cost, particularly if the rehabilitation process has been accepted as complete. Where uncertainty remains, the tendency is to ensure the proponent remains involved and not relieved of liability.

It is our view that mining projects should be designed with the objective of reclaiming the site for relinquishment and future beneficial use. It is clear that relinquishment will not be possible where the environmental, social, political or financial risks/costs are too great. However, we believe that a well-designed and well managed relinquishment policy and program can lead to a win/win situation in many instances. The Five-Step decision making process proposed herein should assist jurisdictions in developing policies and procedures for relinquishment that reflect the regulatory environment of the jurisdiction within the context of mining as an economic development instrument for the jurisdiction.

National consistency would be a very beneficial goal of developing the proposed decision making process.
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