



Energy, Mines and Resources  
Box 2703, Whitehorse, Yukon Y1A 2C6  
Mineral Resources Branch (K-9)

November 18<sup>th</sup>, 2009

Mr. Clynton R. Nauman, President & CEO  
Alexco Keno Hill Mining Corp.  
Suite 1150 – 200 Granville St  
Vancouver, BC  
V6C 1S4

Dear Mr. Nauman

**Re: Bellekeno Mine Project QML-0009 – Plan Requirements**

Paragraph 5.1(b) of QML-0009 (the “license”) requires that Alexco Keno Hill Mining Corp. ensure that each plan that it is required to submit under its license meet certain requirements, as set out by the Chief. These requirements, identified by the plan type noted in Schedule B of the license are as follows.

**A. Reclamation and Closure Plan**

A reclamation and closure plan must include:

- (a) A statement of the objectives to be achieved as a result of reclamation and closure of the site;
- (b) an analysis of the measures required to be implemented to ensure the ongoing physical and chemical stability of the site;
- (c) a description of how the Licensee will meet the performance standards set out in Schedule 1 (attached to this letter) unless other standards are agreed to in writing by the Chief in advance of submission of the plan;
- (d) target indicators to ensure that reclamation objectives have been met;
- (e) engineered (stamped or sealed) designs for the closure of all engineered structures, works, and installations associated with the Undertaking, including embankments

and other containment structures, dry stack tailings facility, spillways, diversion ditches, waste rock and overburden dumps, the Lightning Creek bypass road and any other roads at the site, and ore stockpiles;

- (f) a program and implementation schedule for the removal of all infrastructure at the site, including the mill and all infrastructure, camp and roads;
- (g) a program and implementation schedule for ensuring the long term stability and closure of the dry stack tailings facility and waste rock storage facilities;
- (h) a program and implementation schedule for progressive reclamation to be carried out during development and production;
- (i) a program for revegetation of disturbed areas, including a description of how soils will be tested for quality and quantity of nutrients and organic matter to support plant growth and a description of the seed mix to be utilized;
- (j) details of the covers (if any) to be placed over the non acid generating or metal leaching and the potentially acid generating or metal leaching waste rock storage facilities and dry stack tailings facility;
- (k) a monitoring and maintenance program and implementation schedule to obtain surface and hydrogeological information adequate to verify that the reclamation objectives and discharge requirements applicable for all engineered structures, works and installations are met at closure and post-closure;
- (l) a cost estimate to implement the plan, including a cost estimate for post closure monitoring, inspections, interim care and maintenance;
- (m) details respecting maintenance of security at the site, including any requirements for continuous care by an on-site caretaker, during reclamation and closure and post-closure;
- (n) updates on the collection and interpretation of hydrogeological information, related geochemical effects and water discharge from the mine;
- (o) a program and implementation schedule for determining the effects on the receiving environment during closure and post-closure, including details of monitoring of geochemical and physical stability of all facilities at the Site and other matters as appropriate;
- (p) description of the quantity and quality of available organic material and borrow material stockpiles for use in reclamation;

- (q) list of equipment required to be on-site to ensure that the Licensee can provide an adequate response to an unexpected water flow or level, a spill or a release of a hazardous substance;
- (r) details of how technological developments and best management practices will be incorporated into the plan over time;
- (s) details respecting management of a temporary closure, including the following:
  - (i) how the Licensee will secure the site during a temporary closure and ensure that all engineered structures, works and installations remain stable;
  - (ii) how all engineered structures, works, and installations required to resume mining, milling, hauling and waste treatment will be maintained in good order on the site during a temporary closure;
  - (iii) how the various roads under the control of the Licensee at the site will be monitored and controlled to prevent public use where appropriate and ensure public safety;
  - (iv) a list equipment required to be on-site ensure that any unexpected water flows or levels or other contingencies are properly managed by the Licensee to protect the environment and human safety;
  - (vi) monitoring and reporting schedules for ensuring the geochemical and physical stability of all engineered structures, works, and installations associated with the Undertaking, and
  - (vii) a cost estimate to implement (i) to (vi), as well as any other activities to be undertaken for a temporary closure of five years.

## **B. Waste Management Plan**

The waste management plan must include the following:

- (a) a description of the various special and solid wastes<sup>1</sup> to be generated by the Undertaking and a program for handling, collecting, storing and disposing of these wastes;
- (b) methods to store or remove solid and special waste materials so that they do not attract wildlife and are not potentially harmful to wildlife;
- (c) a description of the incinerator, if any, that will be used to incinerate solid waste;
- (d) a description of any landfill used to store solid waste; and

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<sup>1</sup> These terms have the same meaning as in the *Environment Act*, S.Y. 2002, c.76.

- (e) a description of the management of wastes produced by the settlement ponds, including at the mill, the Bellekeno 625 and the Bellekeno East location, and disposal methods of any resulting sludges.

### **C. Monitoring and Surveillance Plan**

The monitoring and surveillance plan must include:

- (a) details of a surface and groundwater characterization and quality monitoring program that involves acute lethality testing at the site development and production of the Undertaking and includes identification of sampling station locations for the underground workings, milling facilities, waste rock and overburden stockpiles, sediment ponds and other possible sources of site discharge to the environment;
- (b) a program for monitoring conditions at and below natural ground level in the areas of the dry stack tailings and waste rock storage facilities, specifically addressing potential permafrost conditions;
- (c) a program of physical inspections and reporting that provides details of regular inspections by an engineer of the physical stability of all engineered structures, installations and works, including the Bellekeno 625 settling ponds, the Bellekeno East settling ponds, waste rock storage facilities, the dry stack tailings facility;
- (d) an adaptive management plan that describes methods and techniques for collecting monitoring information regarding conditions of engineered structures and environmental conditions at the Undertaking, as well as quantitative thresholds which will trigger implementation of adaptive management strategies, including (i) a description of the potential events that may necessitate action and possible environmental consequences of these events, the location of potential events, monitoring requirements, specific indicators of when an event has occurred and thresholds for taking action;
- (e) a program to monitor waste rock storage facilities to determine whether there is any acid rock drainage or metal leaching from these facilities, including humidity cell testing or other comparable technologies;
- (f) a weather monitoring program that measures precipitation, evaporation rates and solar radiation at the site;
- (g) a program to monitor measure ambient noise from mill operations, construction and use of the Lightning Creek Bypass Road;

- (h) a program to monitor sediment, benthos, fish and periphyton monitoring program for the life of the Undertaking, including comparisons to baseline conditions;
- (i) a program to monitor dust depositions from mill operations, construction and use of the Lightning Creek Bypass Road and the non acid generating or metal leaching waste rock storage facility, as well as adaptive management strategies to reduce these dust levels as required; and
- (j) a reclamation effectiveness monitoring program, to monitor the effectiveness of progressive reclamation and post closure reclamation.

#### **D. Waste Rock Management Plan**

The waste rock management plan must include the following:

- (a) identification of the various types of waste rock to be generated by the Undertaking and a description of the estimated volumes of each type of waste streams throughout the term of the License;
- (b) identification of long term waste rock storage locations and relative volumes of rock to be placed in each location;
- (c) detailed field tracking procedures that will identify the origin of waste rock and its acid generating or metal leaching potential, how it will be transported and to what waste rock storage facility;
- (d) a mine wall testing plan which provides details of how waste rock will be sampled in the underground workings in order to collect representative samples for analysis;
- (e) a waste rock metals and acid base accounting testing plan which describes the methods for metals and acid base accounting of waste rock removed from the mine and details the sampling methodology, the frequency and schedule of sampling; methods of analysis of samples, techniques for evaluating acid base accounting; data processing and sample compositing; the time lag from excavation to testing; and documentation; and
- (f) proposed humidity cell or other testing to monitor the acid rock drainage or metal leaching potential of waste rock storage facilities and any changes to mitigation required to accommodate the results of testing.

#### **E. Noise Abatement Plan**

The noise abatement plan must include:

- (a) the program for a noise impact study to assesses baseline sound conditions (i.e. pre-development), identification of potential noise sources during development and production and noise receivers
- (b) a program for monitoring and assessing noise levels, on both a daily and cumulative basis; and
- (c) a remediation program to reduce noise emissions, including limitation of operating hours, installation of insulation or panels in buildings and the orientation of buildings and a description of how these measures will be incorporated into project design and implementation.

#### **F. Traffic Management Plan**

The traffic management plan must include:

- (a) measures to restrict public access to the site during development, production, a temporary closure and both during and post-closure of the Undertaking;
- (b) identify any restrictions on the use of employee vehicles, such as bussing to the work areas;
- (c) a strategy for the routing of traffic around or through Keno;
- (d) a discussion of what speed limits will be imposed at the site and how these will be enforced;
- (e) a discussion of the controls to be used at highway access points; and
- (f) communications and notification protocols to be used in the case of emergency at the site.

#### **G. Wildlife Protection Plan**

The wildlife protection plan must include:

- (a) measures to deter wildlife access to the Undertaking,

- (b) measures to restrict public access to the site during development, production, temporary closure and both during and post-closure of the Undertaking;
- (c) a program for the monitoring and reporting of wildlife-human interactions at and within the immediate vicinity of the site and appropriate strategies to reduce such interactions;
- (d) identification and posting of appropriate speed limits to reduce wildlife casualties and the method of ensuring that such limits are not exceeded by the employees or contractors of the Licensee;
- (e) mechanisms to ensure that firearms are restricted on site, including employees, management and contractor restrictions pertaining to hunting and fishing, throughout the life of the Undertaking;
- (f) mechanisms to prevent disturbance of wildlife habitat, including denning or nesting sites and to protect wildlife corridors;
- (g) a policy for all employees and contractors to prevent wildlife harassment;
- (h) methods to reduce disturbance to riparian areas;
- (i) mechanisms for avoiding disturbance of any trap lines that may be affected by the Undertaking; and
- (j) strategies and schedules for reducing impediments to wildlife such as plowing back of snow banks, ensuring breaks in snow banks to allow for escape of wildlife from roads and prevention of windrows that could restrict wildlife movements.

## **H. Heritage Resources Plan**

The heritage resource protection plan must include:

- (a) a schedule for training all employees and contractors of the Licensee respecting its heritage awareness policy; and
- (b) a protocol for the identification, reporting and protection of historic objects and human remains, as these terms are defined in the *Historic Resources Act*, S.Y. 2002, c.109 discovered by the Licensee at or on the site.

## **I. Spill Contingency Plan**

The spill contingency plan must include:

- (a) spill response strategies for all hazardous substances used in the Undertaking;
- (b) a schedule for informing employees and contractors of the Licensee about the hazardous substances used at the site and training them as to the appropriate spill response strategies;
- (c) a protocol for ensuring that spill response strategies are posted at all times in various locations at the site, including the mill, explosive storage areas and the camp;
- (d) a list of equipment required and available for responding to, cleaning up and disposing of spilled or released hazardous substances;
- (e) protocols to ensure that vehicles carrying hazardous materials are equipped with a spill kit and personnel trained in spill response measures;
- (f) a reporting chart assigning responsibility to on-site employees of the Licensee, an obligation for reporting spills or any release of hazardous substances into the environment and for implementing the appropriate spill response strategy; an

## **J. Hazardous Materials Management Plan**

The hazardous materials management plan must include:

- (a) safety data sheets for all hazardous substances used in the Undertaking;
- (b) a program for training employees involved in handling hazardous material;
- (c) a protocol for ensuring that all hazardous materials are properly handled and stored to ensure integrity of product containers, accidental mixing of the substances and the effects of inclement weather;
- (d) a protocol to ensure that proper signage for hazardous substances are in place; and
- (e) measures to ensure that secondary containment measures are in place, including secondary containment measures for handling facilities.

## **K. Emergency Response Plan**

The emergency response plan must include:

- (a) on site emergency response and first aid measures, including emergency transportation provisions;
- (b) identification of key contacts for responding to emergencies and reporting emergencies to appropriate government officials and to the proponent;
- (c) identify those situations at the Undertaking that could reasonably create an emergency situation and the response protocols for these situations;
- (d) identify the roles and responsibilities of employees and contractors in emergency situations; and
- (e) identify the location of emergency equipment and location of Material Safety Data Sheets.

## **L. Mine Development and Operation Plan**

The mine development and operation plan must include:

- (a) a geotechnical assessment of the underground design factors;
- (b) a description of the development plans for the mine, including plans and maps showing all related structures, equipment, works and installations associated with the mine;
- (c) a description of methods used to backfill openings, including how acid generating or metal leaching tailings and non acid generating or metal leaching tailings will be used;
- (d) a summary of estimated ore reserves, including the grades, dilution and recovery factors for these reserves;
- (e) a summary of services required to safely operate the mine, including electrical power, communications, ventilation and dewatering;
- (f) a description of ore and waste rock handling procedures, including details of all quality assurance and quality control protocols to be used by the Licensee during development and operation of the underground workings, waste rock storage

facilities, ore stockpiles and other engineered structures, works or installations associated with the Mine;

- (g) a description and analysis of the results of a foundation investigation program and geotechnical analysis carried out by the Licensee for all engineered structures, works or installations associated with the Undertaking;
- (h) plans for the design, construction and use of the non acid generating or metal leaching waste rock storage facility, prepared by an engineer, which incorporates a slope stability assessment and a detailed description of waste rock placement methods and uses the British Columbia Mine Waste Rock Pile Research Committee, 1991 Mined Rock and Overburden Piles Investigation Manual as minimum guidelines for safety;
- (i) a description of distribution and quality of permafrost present under the non acid generating or metal leaching waste rock storage facility;
- (j) a description of the design of the subgrade and foundation of the non acid generating or metal leaching waste rock storage facility, including a shear strength analysis of foundation soils, foundation stabilization options, which could include removal of thaw unstable soils and construction of a toe berm at the facility;
- (k) plans for the design, construction and use of permanent potentially acid generating or metal leaching waste rock storage facilities and temporary potentially acid generating or metal leaching waste rock storage facilities, including locations, construction methods, dumping plan, foundation investigation and design, and how runoff water will be collected and either contained or treated, and how surface runoff will be managed around these facilities;
- (l) a description of volumes and methods by which any potentially acid generating or metal leaching waste rock will be returned underground;
- (m) a description of the layout, configuration and staging of any temporary ore stockpiles, including any design elements associated with the collection, treatment and monitoring of run-off;
- (n) methods used for suppressing dust, such as water or calcium chloride, throughout the area of the Undertaking, other than the underground workings;
- (o) methods for erosion protection along roads and facilities and methods to minimize riparian removal and ensure drainage channels are maintained and debris free; and

- (p) a strategy and implementation protocol for required dewatering of the underground.

#### **M. Mill Construction and Operation Plan**

The mill construction and operation plan must include:

- (a) a description of production rates and mineral products to be produced, including a process flow sheet;
- (b) a summary of the processing methods to be used, including identification of the equipment used, by-products to be produced and chemical reagents to be stored and consumed in the mill;
- (c) description of the methods to produce various tailings types, such as pyritic (acid generating or metal leaching) tailings and non pyritic (non acid generating or metal leaching) tailings, and how these tailings will be stored, either temporarily or permanently underground or in the dry stack tailings facility;
- (d) a description of the layout, configuration and staging of any temporary ore stockpiles, including any design elements associated with the collection, treatment and monitoring of run-off;
- (e) a description of how emissions and dust levels will be monitored and methods used (such as scrubbers or filters) to reduce these levels where necessary;
- (f) methods to reduce light pollution from stray ambient lighting;
- (g) methods to reduce brush clearing to limit views of the mill facility;
- (h) drawings and designs of the processing facilities and equipment in the mill;
- (i) description of concentrate product storage, handling and transportation;
- (j) identification of electrical sub-stations and stand-by generators; and
- (k) methods of fuel storage and handling.

#### **N. Dry Stack Tailings Facility Plan Construction and Operation Plan**

The dry stack tailings facility construction and operation plan must include:

- (a) final designs and specifications of all engineered structures forming part of the dry stack tailings facility, including seepage collection and diversion ditches, locations of piezometers and other monitoring instruments,
- (b) a description of measures carried out to determine permafrost presence and native soil characterization under the facility and a detailed stability assessment that includes potential settlement during tailings placement and long term stability;
- (c) a description of the design of the subgrade and foundation, including site preparation, foundation stabilization options which were considered, such as removal of thaw unstable soils;
- (d) quality assurance and quality control measures for construction of all structures forming part of the dry stack tailings facility;
- (e) an assessment of the potential dispersal of contaminant dust from the dry stack tailings facility to Keno, based on wind dispersion models and local meteorological conditions;
- (f) methods to reduce dust generated by wind or traffic on the dry stack tailings facility; and
- (g) a tailings operations, maintenance and surveillance manual, to be prepared by an engineer and used by the Licensee. The manual must be prepared in accordance with the guidelines contained in the document "Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities, Mining Association of Canada, 2003".

## **O. Lightning Creek Bypass Road Construction and Operation Plan**

The Lightning Creek Bypass Road construction and operation plan must include:

- (a) methods to minimize disturbance of riparian areas;
- (b) designs for the Lightning Creek bridge and bypass road prepared by an engineer;
- (c) designs for bridge and highway intersections approaches to minimize safety concerns;
- (d) measures to ensure stability of stream banks at bridge crossing;

- (e) design and construction methods for a culvert at Lightning Creek should a bridge not be built.
- (f) sediment and erosion control methods during construction and operation and monitoring procedures;
- (g) methods to limit suspended solids from entering the watercourse from the bridge deck and approaches
- (h) construction methods to minimize fish disturbances;
- (i) methods to prevent and deal with possible spills and prevent contaminants from entering the watercourse;
- (j) methods to reduce dust from loads being transported by transport trucks, including both ore and tailings haulage;
- (k) procedures to maintain a reasonable level of ore transport vehicle cleanliness; and
- (l) methods to suppress road dust, including any proposed hard surfacing of roads.

## **P. Annual report**

The annual report must include:

- (a) a summary of construction activities associated with the Undertaking;
- (b) a summary of mining activities;
- (c) a map showing the status of all structures, works, and installations associated with the Undertaking;
- (d) the total amount of ore and waste removed from the underground workings;
- (e) the total amount and the average head grade of ore milled;
- (f) the remaining reserve life of the mine;
- (g) any temporary closure or permanent closure that has occurred during the year;
- (h) the total amount of concentrate produced and removed from the Undertaking;

- (i) the total amount of tailings deposited in dry stack tailings facility;
- (j) the total amount of non acid generating or metal leaching and potentially acid generating or metal leaching waste rock removed from the mine and its deposit location;
- (k) the total amount of waste rock stored in each waste rock storage facility;
- (l) the amount of potentially acid generating or metal leaching waste rock stored underground;
- (m) the amount of pyritic and other tailings disposed of underground and the location of its deposition;
- (n) as-built drawings of the mine and of all engineered structures, works, and installations constructed or altered at the Undertaking during the year;
- (o) details respecting any action taken as a result of the recommendations made by the engineer in relation to the inspection referred to in 14.1 of QML-0009;
- (p) a summary of any updates to estimates of ore reserves and the life of the mine, including reserve category, tonnage and grade;
- (q) a summary of any underground stability incidents;
- (r) a summary of humidity cell or other geochemical tests undertaken on waste rock;
- (s) a summary of the programs undertaken for environmental monitoring and surveillance as outlined in the monitoring and surveillance plan and the wildlife protection plan, including an analysis of these data and any action taken or adaptive management strategies implemented to monitor or address any changes in environmental performance;
- (t) a summary of progressive and ongoing reclamation activities;
- (u) a summary of proposed development and production for the coming year;
- (v) a summary of activities related to care and maintenance of the Undertaking, including any temporary closure activities, if applicable;
- (w) a summary of spills and accidents that occurred at the Undertaking;
- (x) a summary of the previous and projected use of the Lightning Creek Bypass Road and the Christal Lake Road, including maintenance work conducted;

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- (y) a summary of the level of traffic, access control issues, wildlife incidents and other accidents, and any upgrade or maintenance work planned for the upcoming year; and
- (z) a summary of the results of the waste rock quality assurance/quality control monitoring for the past year, and volumes of waste rock managed at the site by various streams.

For reference, any of the terms defined in the license have the same meaning in this letter.

Should you have any questions about these requirements, please contact me.

Yours truly,

A handwritten signature in black ink, appearing to read "R. Holmes". The signature is fluid and cursive, with a prominent initial "R" and a long, sweeping tail.

Robert Holmes  
Chief of Mining Land Use

# **SCHEDULE 1**

## **TERRESTRIAL PERFORMANCE STANDARDS**

### **A. Overall Objectives**

1. The protection of health and safety of the public and area wildlife by the elimination of unacceptable health hazards.
2. Reclamation for productive future use of the land where infrastructure (buildings, chemical and fuel storage, roads, sediment ponds, dry stack tailings facilities, waste rock storage areas, underground workings, etc.) is or will be located.
3. Prevention of significant exposure to or release of substances that could damage the receiving environment.
4. Restoration of the site to a condition that is visually acceptable to Yukoners.
5. Minimization or elimination of the need for maintenance and monitoring in the long term.
6. Minimization of liability and environmental risk.
7. Minimization of the footprint of mine site development.

### **B. Water Retention and Sediment Control Structures**

#### Objectives

The objective is to ensure decommissioning of water retention and sediment control structures, and their appurtenances, in such a way that drainage at, and adjacent to the site, is stable in the long term.

#### Practice

Typically this objective means dismantling and disposing of operational structures so that natural drainage is not impeded.

The planning goal should be minimal maintenance requirements for areas reclaimed of surface water management structures. For example, operational sediment traps, basins, silt fencing, spillways and dikes should be dismantled and materials disposed of in an approved non-hazardous solid waste dump or be removed from the site.

Collection and diversion systems for passive treatment that are put into place or remaining at closure in order to recover contaminated percolation waters or runoff shall require minimal maintenance. Those structures that are defined as dams are to meet the provisions of the Canadian Dam Safety Guidelines. Any additional stability criteria will be commensurate with the level of risk associated with failure of the collection systems. All engineered impoundment structures shall be certified by a qualified professional engineer with respect to their long-term physical and chemical stability.

Unless an alternate use is identified in an approved reclamation and closure plan, mine dewatering ponds should be decommissioned, with sediments stabilized, pond dikes leveled and the surface contoured and re-vegetation underway.

Fines, sludge and sediment meeting the definition of tailings must be removed to an approved tailings facility or be otherwise decommissioned in accordance with the approved reclamation and closure plan.

Water course diversions shall be dismantled and materials disposed of in an approved non-hazardous solid waste dump according to the Solid Waste Regulations in the *Environment Act*, or removed from the site.

### **C. Watercourses**

#### Objectives

Restore watercourses to meet current water management objectives.

#### Practice

Restore watercourse in accordance with the approved reclamation and closure plan. The plan shall take into account the intended future land use, as well as water management objectives that have been established under legislation

### **D. Water Quality**

#### Objectives

The objective is to prevent contamination of receiving environments

#### Practice

Following decommissioning, water quality must consistently meet the requirements of applicable territorial and federal legislation. For example, it must meet the requirements of the *Waters Act* respecting the deposit of waste into water or into other places where the waste may enter water such as groundwater that may reach surface water. Produced water must also meet the *Fisheries Act* (Canada) requirements with respect to the deposit of deleterious substances, including, if applicable, discharge standards set out in the Metal Mine Effluent Regulations of the *Fisheries Act* (Canada). Where the site is a contaminated site, as defined by the *Environment Act*, the site must be restored and maintained as required by the *Environment Act* and regulations made under it.

Recognition will be given to background levels of substances naturally occurring as identified prior to start-up of production.

### **E. Site Contamination**

#### Objectives

The objective of addressing contamination is to prevent exposure to and mobilization of substances that pose a risk to human health and the environment through physical and chemical stability.

#### Practice

Leading up to closure, a site contamination assessment plan must be prepared which:

- Locates through a site investigation program any and all contaminated material on the mine site arising from any operation, transportation, storage handling or processing;
- Characterizes the type, level and horizontal and vertical extent of the contamination; and
- Proposes methods for dealing with the contamination.

Whether through neutralizing, treating or disposing, soils, sub-soils and materials on the site must meet the appropriate level of decontamination, commensurate with the proposed future land use objective set out in the approved reclamation and closure plan.

Where the site is a contaminated site under the *Environment Act*, the requirements for a site contamination assessment plan, investigation, reports and plans for restoration will be required according to the Contaminated Sites Regulation of the *Environment Act*. A final report must be submitted to the Yukon government on the implementation of the approved Plan of Restoration under the Contaminated Sites Regulation of the *Environment Act*.

The requirements of the Occupational Health and Safety Regulations set out by the *Occupational Health and Safety Act*, for controlled substances under the *Hazardous Products Act* (Canada) must be met. So too are the requirements of the Special Waste Regulation of the *Environment Act*.

## **F. Acid Rock Drainage Potentially**

#### Objectives

The closure objective for acid rock drainage and metal leaching is a walk-away solution. Reliance on long-term active treatment is not considered acceptable for reclamation and closure planning.

#### Practice

Rock piles, dumps, tailings and underground workings must be decommissioned such that in the event of acid rock drainage and metal leaching ground and surface water quality objectives continue to be met.

Following decommissioning, drainage from the site or from passive treatment must consistently meet the requirements of applicable territorial and federal legislation. For example, it must meet the requirements of the *Waters Act* respecting the

deposit of waste into water or into other places where the waste may enter water such as groundwater that may reach surface water. Produced water must also meet the *Fisheries Act* (Canada) requirements with respect to the deposit of deleterious substances, including, if applicable, discharge standards set out in the Metal mine Effluent Regulations of the *Fisheries Act* (Canada). Where the site is a contaminated site, as defined by the *Environment Act*, the site must be restored and maintained as required by the *Environment Act* and regulations made under it.

Walk-away solutions for spillways, together with natural passive management of discharges not requiring active intervention are preferred. A near-neutral pH water discharge from the site is the optimum goal.

## **G. Tailings Management**

### Objectives

The closure objectives for decommissioning tailings are to

- Ensure physical and chemical stability for the long term; and
- Eliminate the need for long term active treatment.

### Practice

All engineered impoundment structures shall be certified by a qualified professional engineer with respect to their long-term physical and chemical stability. For tailings facilities the design must support the objectives for the final land use identified in the approved reclamation and closure plan and related water quality objectives.

Following decommissioning, drainage from the tailings or from passive treatment must consistently meet the requirements of applicable territorial and federal legislation. For example, it must meet the requirements of the *Water Act* respecting the deposit of waste into water or into other places where the waste may enter water such as groundwater that may reach surface water. Produced water must also meet the *Fisheries Act* (Canada) requirements with respect to the deposit of deleterious substances, including, if applicable, discharge standards set out in the Metal Mine Effluent Regulations of the *Fisheries Act* (Canada). Where the site is a contaminated site, as defined by the *Environment Act*, the site must be restored and maintained as required by the *Environment Act* and regulations made under it.

Dry-paste tailings and dewatered tailings shall be capped as specified in an approved reclamation and closure plan. Drainage intercepts and diversions shall be in place as required in an approved reclamation and closure plan in support of established water quality objectives.

The design criteria shall meet provisions of the Canadian Dam Association's *Dam Safety Committee Guidelines* and Mining Association of Canada's *Guide to the Management of Tailings Facilities*.

Structures shall be maintained until they are no longer required.

Reliance on the long-term use of active effluent treatment facilities to meet the required performance objectives for discharge and environmental acceptability is not considered acceptable for reclamation and closure planning.

When operations cease, the mine owner must provide tailings facility surveillance and monitoring plans; including identification of failure modes; event-driven interventions and notification network; contingency plans as required; and emergency response plans and activation criteria.

## **H. Underground Workings and Openings to Surface**

### Objectives

The closure objectives for underground workings and opening to surface are to

- Meet water quality objectives;
- Except for authorized access, prevent inadvertent or intentional underground access that may be a hazard to humans and wildlife; and
- Prevent subsidence or other changes in the topography that may result in a hazard to humans and wildlife.

### Practice

At final closure, all surface openings to underground workings (raises, shafts, excavations, tunnels, chutes) must be blocked utilizing a suitable design method with consideration to the requirements of the Occupational Health and Safety Regulations of the *Occupational Health and Safety Act*.

Any material or equipment proposed to be left in the underground areas must be decontaminated.

Plans of underground workings, including ramps, adits and other openings to surface and any remaining related structures, equipment or materials to be left in place, shall be provided to Yukon, as well as any additional information as required by the Occupational Health and Safety Regulations of the *Occupational Health and Safety Act*.

Where there is a demonstrated risk, and potentially significant consequence, that mine water pressures are likely to build to dangerous levels, drainage of excess mine water through a long-term drain shall be included.

Ensure final crown pillars that are to remain in place provide long-term structural stability. The crown pillar must sustain its own weight and other anticipated surface loads, including static and dynamic loading. Stability calculations will be based on current standards and a design certified by a qualified professional engineer must be provided.

If the approved reclamation and closure plan does not include retaining a crown pillar, then the opening may be subject to the requirements for opening to surface and/or of rock piles as set out in the approved plan. Where long-term stability of pillars cannot be assured, fencing and signage will be required.

## **I. Terrain Hazards**

### **Objectives**

The closure objective for decommissioning is that remaining terrain hazards at the site should present no more significant hazard to people and wildlife than is present in the surrounding vicinity.

### **Practice**

Excavations, including borrow pits, and stripping zones must be backfilled or otherwise made safe in accordance with the approved reclamation and closure plan. In some cases, an embankment with a ditch in front may be accepted. Determinations for backfilling will account for risk and economic feasibility.

Access to areas of unsafe drop-offs must be blocked and posted appropriately. The requirements of the Occupational Health and Safety Regulations as set out in the *Occupational Health and Safety Act* must be followed.

Waste rock storage areas shall be re-contoured to a stable configuration and when specified in an approved reclamation and closure plan, left in a condition conducive to successful re-vegetation.

## **J. Mine Rock Piles**

### **Objectives**

Reclaimed rock piles and dumps must be physically and chemically stable in the long term to prevent erosion, subsidence or collapse, and such that dump runoff and surface drainage meet legal requirements.

### **Practice**

Rock piles and dumps shall be reclaimed to ensure long-term stability and erosion control.

Waste rock that is susceptible to acid drainage and metal leaching must be closed out to ensure long-term stability—structural and chemical. This could be accomplished through full encapsulation, sealing in benign rock or other clean cover, flooding, sequestering below the water table, returning to pit, or underground

or otherwise stabilized in accordance with an approved reclamation and closure plan.

Rock piles and dumps shall be monitored for physical stability during all phases of closure until judged no longer necessary by the Chief of Mining Land Use. Major piles must be re-contoured to be consistent with the approved final land use for the mine site.

Subject to a water license under the *Waters Act* remaining in place, chemical stability shall be monitored until the license is revoked. Following decommissioning, drainage from rock piles must consistently meet the requirements of applicable territorial and federal legislation. For example, it must meet the requirements of the *Waters Act* respecting the deposit of waste into water or into other places where the waste may enter water such as groundwater that may reach surface water. Produced water must also meet the *Fisheries Act* (Canada) requirements with respect to the deposit of deleterious substances, including, if applicable, discharge standards set out in the Metal Mine Effluent Regulations of the *Fisheries Act* (Canada). Where the site is a contaminated site, as defined by the *Environment Act*, the site must be restored and maintained as required by the *Environment Act* and regulations made under it.

Active treatment systems may be required initially to collect and treat contaminated runoff from rock piles. Control systems must be established as close to the source as possible. Reliance on long-term active effluent treatment facilities is not normally considered acceptable to meet closure requirements.

Reclaimed piles and dumps may require measures to ensure re-vegetation, wildlife and human safety objectives are met, and shall be completed in accordance with an approved reclamation and closure plan and the requirements of the Occupational Health and Safety Regulations as set out in the *Occupational Health and Safety Act*.

## **K. Roads and Other Access**

### Objectives

Protection of public safety is a key objective. As well, in decommissioning linear infrastructure the intention is to enable human and wildlife utilization in the area to revert to pre-development levels and types, all other factors being equal. If, however, an alternative future land use has been identified for the site, or population in the area has increased, alternative objectives may be identified in the approved reclamation and closure plan.

### Practice

In planning and implementing road deactivation and reclamation, consideration shall be given to monitoring and maintenance requirements of any structures. Temporary fencing or surveillance may be necessary to prevent access until closure is complete.

Unless the Minister responsible under the *Highways Act* provides written notification of a public interest in maintaining identified roads for public use under the administration and control of the *Highways Act*, all on-site roads, trails and access corridors shall be decommissioned, including the following measures as needed:

- Removal of bridges, culverts and pipes; ramps and landings at the mine site. Streambeds re-established with appropriate stabilization of banks;
- Stabilization of road cuts and fills;
- Installation of diversion berms on steep slopes;
- Scarification of road and airstrip surfaces;
- Ensuring road cuts are stable
- Restriction of access with appropriate signage for areas posing a safety risk; and
- Roads and trails identified for decommissioning in an approved reclamation and closure plan should be made impassable to vehicles.

Access to the mine site subject to an easement, right of way or lease under the *Lands Act* shall be subject to deactivation and reclamation pursuant to the authorization under the *Lands Act*. Reclamation of access to the mine site traversing and located on First Nations Settlement Lands may be subject to the requirements of a First Nations Final Agreement.

## **L. Erosion Control**

### **Objectives**

The objective of erosion control is physical stability, such that upon closure, slopes, excavations and other disturbed lands are in a condition that will limit the incidence of soil erosion, slumping and other instabilities that are likely to impede re-vegetation of a reclaimed site, pose a threat to public safety, lead to wildlife mortality, or cause excessive sediment loads to enter nearby water bodies.

### **Practice**

As identified in an approved reclamation and closure plan, slopes must be stabilized by benching, contouring and levelling.

Erosion may occur while stabilization and re-vegetation are actively in progress. In some circumstances, erosion may be progressing such that unchecked, it will lead to conditions that are likely to pose a threat to wildlife, public safety or result in excessive sediment loading in nearby water bodies. Under anticipated post-closure site drainage conditions, advancing erosion (for example, from splash erosion to rills) should be reversed to a point where stabilization and re-vegetation are likely to be successful in site rehabilitation.

Diversion ditches, if needed, must be constructed to guide drainage away from reclaimed workings.

The selected soil cover material must contain adequate growth media (fines) to sustain re-vegetation.

Vegetative mat is to be sufficient to control erosion.

Appropriate pit ponds and decants should be in place to meet erosion prevention objectives.

## **M. Re-vegetation**

### Objectives

To ensure physical stability and to prevent a temporary loss of wildlife habitat utilization from becoming permanent, through the re-establishment of a vegetative mat (food source, hide, etc.) leading to self sustaining native vegetation.

### Practice

As much as possible, decommissioning should focus on site preparation that is conducive to natural re-vegetation.

Vegetation is to be self sustaining, comprising native seed mixes, unless otherwise specified in an approved reclamation and closure plan. In designing ground cover and vegetation, consideration shall be given to altitude and orientation (e.g. north-facing slopes). Vegetation should normally be self sustaining within six years of the last application of cover, seed or fertilization.

The vegetative cover is to be capable of self-regeneration without continued dependence on fertilizer or reseeded.

Vegetative cover should demonstrate sufficient density and species diversity to stabilize the surface against the effects of long term erosion.

Where needed, cover is to be designed to inhibit uptake of metals by plants.

## **N. Mine Infrastructure**

### Objectives

The objective following closure is to ensure physical stability and to remove potentially threats to public health and safety; including identification and removal of hazards and hazardous materials.

### Practice

All buildings and structures must be dismantled and disposed of in a manner consistent with the approved final land use of the site identified in an approved

reclamation and closure plan and to meet the requirements of the Occupational Health and Safety Regulations as set out in the *Occupational Health and Safety Act*.

Waste arising from dismantling and demolition of structures is to be disposed of in an approved manner, which may include a waste disposal site authorized under the Solid Waste Regulations of the *Environment Act*.

All machinery, equipment and storage tanks must be cleaned and removed from the site or disposed of on site in an approved manner.

Sites of all buildings and structures shall be reclaimed so as to protect human safety and prevent wildlife mortality.

All concrete structures, foundations and slabs shall be removed and levelled to surface and where indicated in an approved reclamation and closure plan, covered and re-vegetated.

All power transmission lines, pipelines and railways shall be dismantled and removed from the site or otherwise disposed of, to the extent that is consistent with the approved future use of the land identified in an approved reclamation and closure plan. Power supply shall be disconnected in accordance with the Occupational Health and Safety Regulations of the *Occupational Health and Safety Act*.

Buried support infrastructures (tanks, pipes, underground services, etc.) identified in an approved reclamation and closure plan for removal at closure must be removed.

Any buried infrastructure remaining will be identified on site closure maps submitted, upon closure, to the Yukon government.

After being emptied, septic tanks will be either removed or filled with gravel, sand, earth or inert material.

Fuel storage tanks shall be decommissioned and removed in accordance with the Storage Tanks Regulations of the *Environment Act*.

All explosives and hazardous substances shall be removed from the site or be properly disposed of in accordance with the requirements of the Occupational Health and Safety Regulations of the *Occupational Health and Safety Act*.

All non-hazardous waste materials may be disposed of in an approved non-hazardous solid waste dump and shall be decommissioned according to the Solid Waste Regulations of the *Environment Act*.

No hazardous materials shall remain on site unless an approved special waste site has been established and approved in accordance with the Special Waste Regulations of the *Environment Act*.

## **O. Temporary Closure Site Conditions**

### Objectives

The objective is to ensure public health and safety and protection of the environment in the event of a temporary closure and to manage risks associated with the potentially abandonment of a site.

Temporary and/or seasonal closure plans will be reviewed and approved by the Yukon government.

### Practice

A temporary closure is considered to last more than six months and no longer than five years, unless otherwise specified in an approved reclamation and closure plan.

Temporary closure includes planned and unplanned closures. Planned closures may include

- Production or process interruptions addressed in a quartz license, with specific triggers (such as termination of a forward sales contract combined with suppressed metal market conditions, specified site conditions) or to allow planned retrofits, refurbishments or expansions; and
- As a result of change in ownership, requiring closure to accommodate changes in permits, authorizations and satisfaction of security requirements.

Unplanned closures include

- Cessation of operations because of litigation;
- Cessation of operations as a result of unforeseen financial circumstances on the part of the mine owner; and
- Cessation of operations because forecast site conditions vary from those used to develop the operating plan and project design, and as a result, a closure lasting more than six months must occur to allow for re-design and facility upgrade.

Temporary closure should include the following reclamation practices

- Facilities and equipment on site remain substantially intact and maintained in working order so that production may resume;
- Uninterrupted site maintenance;
- Maintenance of all monitoring, reporting and existing reclamation;
- Increase security as required to cover the liability associated with the temporary closure, until such time as the liability associated with the temporary closure has been eliminated by the mine owner through care and maintenance facilities and operations. Such care and maintenance

measures may include interim control of tailings, effluent run-off; securing of the site and facilities etc.; and

- Identify unanticipated risks of significant adverse effects resulting from the temporary closure that are not addressed in the approved reclamation and closure plan, and ensure those matters are addressed in an updated plan and associated security.

In the event of an unplanned temporary closure, a full review of the reclamation and closure plan as well as liability estimate and security may be undertaken. If the outstanding liability increases due to a temporary closure, and the mine owner implements the Temporary Closure Plan, these measures will be considered to offset the increased liability and further security may not be required.

Unless otherwise specified in a production license issued pursuant to the *Quartz Mining Act*, where a licensee reasonably anticipates that a temporary closure will occur, the licensee is to provide the Yukon Government with 10 days prior notice of the closure.

Whether or not notice has been provided the licensee must implement the approved Temporary Closure Plan. The licensee must ensure that all protective measures have been taken, including those listed below, to prevent personal injury, property damage and damage to the environment. In addition, the licensee must ensure that all necessary measures have been taken to meet the requirement of the Occupational Health and Safety Regulations of the *Occupational Health and Safety Act*. Measures to be undertaken include:

- a. Secure opening to the surface;
- b. Surveillance, gating or otherwise closing of all entries to and exits from the site to prevent unauthorized or inadvertent access;
- c. Stabilization of all surface areas disturbed;
- d. Securing of all buildings, power transmission sources and other structures and facilities at the site;
- e. Securing of all machinery, equipment and storage tanks at the site;
- f. Securing and storage of petroleum products, hazardous substances and chemicals from the site as specified in the Temporary Closure Plan;
- g. Stabilization of all landfill sites and other waste management areas;
- h. Securing of tailings storage and impoundment areas;
- i. Implementation of a regular environmental and safety monitoring regime to ensure that the site remains secure and stable; and
- j. Regular reporting in accordance with an approved Temporary Closure Plan.

## **P. Geological Values and Heritage**

### **Context**

Ensuring post-closure access to geological information identified leading up to and during mineral development and production at a mine site.

## Requirements

A particular feature, excavation or material such as core shall be conserved if the Minister of Energy, Mines and Resources is satisfied that it should remain on site, or in a condition amenable to future geological assessment or a geological attraction, without removal, backfilling, re-vegetation or other form of reclamation or decommissioning. At the discretion of the Minister, geological features may include those relevant to future exploration and development or re-commissioning of the site.

The feature may be conserved provided appropriate fencing or signage is erected so that the feature does not present a danger to public health and safety, or risks for wildlife. Such measures shall meet the requirements of the Occupational Health and Safety Regulations of the *Occupational Health and Safety Act*.