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MINING SITE REHABILITATION REQUIREMENTS AS STIPULATED IN THE MINING ACT

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ABSTRACT

In 1995, the Québec government amended the Mining Act to establish a framework for the reclamation and rehabilitation of land affected by mining activities. Before beginning their activities, all holders of mining rights who carry out exploration-related work, operate a mine or produce concentrate from mineral substances must submit a rehabilitation plan accompanied by a financial guarantee covering the cost of restoring the site to a satisfactory condition.

This presentation is divided into two parts. The first consists of a brief discussion of current legal provisions and how they affect the holders of mining rights, mine operators, mining activities, mineral substances and monetary obligations related to the guarantee. The second explains what the Québec government (Department of Natural Resources) means by "restoring a site to a satisfactory condition". Following the description of the objectives of mining site rehabilitation, the main rehabilitation requirements are presented with a slide show illustrating examples of mining site rehabilitation.

INTRODUCTION

The Quebec mining industry is a cornerstone of regional development, generating 17 000 direct jobs across the province (MRN, 1998). In 1998, mineral production was valued at CDN$3.4 billion, with total investments of CDN$935 million, and exploration-related expenses of CDN$155 million, down 16% from the previous year. All Québec regions are open to mining exploration and elicit considerable interest on the part of the industry. The Mid-North is one such region, continuing to show a high potential for discovering mineable deposits.

Mining activities are essential for Québec's economic development. The Québec mining industry consists of 67 mines, which exploit substances such as iron, copper, gold, niobium, zinc, nickel and asbestos. It also includes 16 primary processing plants including, among others, those of copper and zinc refining and iron pelletizing. Québec ranks among the world's top ten mineral producers.

However, mining activities produce a large quantity of tailings. In Québec, mining activities generate more than 100 million tonnes of mining-related waste, which is dumped in either waste rock piles or tailings ponds year after year. Excluding quarries and sand pits, the total surface area affected by rock piles and tailings ponds is approximately 13 641 hectares spread out over 377 surveyed sites, 107 of which, representing 6 705 hectares, are still used by mining companies in operation (Marcotte, 1990). In terms of breakdown, 48 % of the surface areas affected contain neutral tailings, 29 % acidic tailings and 23 % alkaline tailings. Of that number, 72 % contain tailings from mineral processing plants, 20 % waste rock and 8 % sedimentation and polishing ponds.

Mining is governed by the Québec Mining Act administered by the Ministère des Ressources Naturelles (MRN) and by Ministère de l'Environnement Directive 019, which defines environmental requirements for mining projects. Although the

Directive 019 stipulate the requirements related to issuing certificates of authorization, it does not explain the terms governing the rehabilitation of mining sites which have been, or will be, affected by mining activities (exploration or mining). Nor does it ensure that the sums required for rehabilitation are available when needed. In this paper, «Rehabilitation» designates all activities associated with restoring and reclaiming the mining site.

Since the shutdown phase is part and parcel of the life of a mine, it is essential that exploration and mining be planned from the outset. Consequently, Québec's Mining Act has been amended to include the rehabilitation of sites affected by mining activities. The responsibility for mining site rehabilitation falls to the MRN which is already responsible for developing mineral resources in the public domain (management of mining rights for exploration and mine operation). This legislation enshrines the principle of sustainable development adopted by the MRN. Moreover, these new provisions of an environmental nature applied by the MRN do not restrict the application of the Environment Quality Act of the Ministère de l'Environnement.

LEGAL OBLIGATIONS

The Act (M-13.1, s...) defines the objectives of the measures implemented as well as general rules of enforcement (MRN, 1996). The Regulation (M-13.1, r.1, ...) specifies the terms and conditions for enforcing the Act (MRN, January 1996).

Any company which engages in exploration or mining, operates a concentrating plant or performs work in tailings ponds must restore the sites affected by its activities (M-13.1, s. 232.1). The company must have its rehabilitation plan approved by the MRN before mining activities begin (M-13.1, s. 232.2). Should the company fail to carry out this obligation, the MRN may have the work done at the company's cost and recover the expenses from the amount provided as a financial guarantee (M-13.1, s. 232.8). Any sum owing the government under this legislation constitutes a privileged debt on all the debtor's property (M-13.1, s. 232.9).

The persons governed by this Act (M-13.1, s. 232.1) are:

- The holders of mining rights who carry out underground exploration or major surface work or who agree to have such work done on the property for which they hold the mining rights;
- The operators of metal mines, asbestos mines and mines of certain non-metallic substances who carry out mining activities;
- A person who operate an ore processing plant (including regional or set-price concentration plants);
- The persons who carry out mining operations using tailings.

All underground work related to mining exploration must be governed by a rehabilitation plan, whereas for surface mining, only major exploration work requires such a plan (ore sample ≥ 500 mt, excavation ≥ 10 000 m^3, stripping ≥ 10 000 m^2) (M-13.1, r. 1, s. 96.2). Drill-holes, excavation, movement or sampling of accumulated material in accumulation areas constitute activities governed by the Act, as does their development during mining. It is vital that all work carried out in an accumulation area receive the prior approval of the MRN to avoid any damage that could be caused, among other things, to a storage area already rehabilitated (break in the cover material, releasing of substances that are detrimental to the environment, etc.).

Where exploration is concerned, any activities related to mining (or tailings), ore (or tailings) processing or accumulation area development are governed by the Act (M-13.1, r. 1, s. 96.3). Although smelting activities are excluded, smelter accumulation areas are not.

In general, all mineral substances for which exploration is carried out on public domain lands are governed by the legislation. For mining, the legislation is applies to all mineral substances except petroleum, natural gas, brine and surface mineral substances excluding inert tailings used in construction (M-13.1, r.1, s. 96.4). The mineral substances contemplated include precious metals, base metals and the following minerals: iron, talc, graphite, mica, magnesium, asbestos, titanium and salt.

The rehabilitation plan

The persons governed by these legal measures must submit, for MRN approval, a rehabilitation plan along with the description of the financial guarantee before the beginning of the exploration and/or mining activities (M-13.1, s. 232.2).

Since each case is unique, it is impossible to define a normative framework in the legislation for restoring the site to a "satisfactory condition" after mining activities have ceased. The rehabilitation plan must include a description of the mining activities carried out or planned, the rehabilitation measures planned once mining has ceased (M-13.1, s. 232.3), a description of the work and progressive steps for carrying it out (where applicable), the work phases to be carried out once activities cease definitively, and a cost estimate for the work planned.

Before approving the rehabilitation plan, the MRN consults the Ministère de l'Environnement (M-13.1, s. 232.5), since the mining activities involved are subject to the Environment Quality Act. For the final rehabilitation plan authorization, the MRN requires a financial guarantee paid according to the terms and conditions indicated in sections 96.6 and 96.7 of the Regulation (M-13.1, r. 1). Depending on the case, the MRN may stipulate that the financial guarantee be paid in part or in full (M-13.1, s. 232.5). Finally, the MRN may ask for any additional information that it might require (studies, analyses, etc.) and that it deems relevant for approving the rehabilitation plan.

Revision of the plan and the guarantee

Once the plan has been approved, a date not exceeding five years hence must be planned for its review (M-13.1, s. 232.6). This review may be moved up if changes in mining activities or in the rehabilitation measures chosen for the accumulation areas justify modifying the plan, either at the operator's request or if the MRN deems this to be necessary. Depen-

ding on the changes made to the rehabilitation plan, the amount of the financial guarantee may be reduced or increased as needed (M-13.1, s. 232.7). Finally, the Ministère de l'Environnement is consulted once again before the MRN approves the revised rehabilitation plan.

The financial guarantee

A financial guarantee must accompany the rehabilitation plan submitted to the MRN (M-13.1, s. 232.4) to ensure that the work is actually done. The amount of the guarantee must correspond to 70% of the estimated costs of rehabilitation of the accumulation areas (M-13.1, r. 1, s. 96.5) as determined when the plan is approved or reviewed.

The financial guarantee may take the form of a cash deposit or certified cheque (CDN$), a bond payable to the bearer, a guaranteed investment certificate, a term deposit certificate payable to the Québec government, an irrevocable, unconditional letter of credit, a security or guaranteed policy issued by an insurance company, an immoveable hypothec of the first rank provided by a third party, or a deposit in a trust account or with a financial institution (CDN$).

The MRN demands guarantees that will be easily convertible to facilitate the administration and the collection of the sums owing in the event of default. The MRN does not accept as a financial guarantee, real estate assets such as a mineral processing plant. However, a bank that would accept such assets as collateral could issue a letter of credit.

Mine life

Payment of the financial guarantee is defined according to mine life (mining) or activities carried out (exploration). For exploration work, mine life is determined according to the nature of the activities (sampling, re-opening of an old mine with drilling programs, etc.). For new mining operations, mine life is estimated using the information contained in the feasibility study; for existing mines, it is based on the assessment of proven economic reserves. For custom milling plants and smelters, mine life is based on orders pending.

Terms and conditions governing the guarantee

Where exploration is expected to last one year or less, the total guarantee must be paid in full within 15 days of the rehabilitation plan's approval by the MRN. Where exploration is expected to last more than one year, the guarantee must be submitted in annual payments corresponding for the first year to the evaluation of the cost of rehabilitation work for the activities already carried out and those that will be carried out by the end of the year and for subsequent years to the estimated cost of the rehabilitation work for activities carried out during a given year.

For mining and custom milling, the financial guarantee payment schedule is shown in Table 1 and is based on the shortest duration defined when the rehabilitation plan was approved or revised.

Payment —> / Expected mine life ↓	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.0								Operating activity less than 10 years: right to defer one annual payment. No deferment allowed in the last two years. Operating activity 10 years or more: right to defer two annual payments. No deferment allowed in the last three years.						
2	1.0														
3	.250	.750	–												
4	.111	.333	.556	–											
5	.063	.187	.313	.437	–										
6	–	.063	.187	.313	.437	–									
7	–	.040	.120	.200	.280	.360	–								
8	–	.028	.083	.139	.194	.250	.306	–							
9	–	.020	.061	.102	.143	.184	.225	.265	–						
10	–	–	.020	.061	.102	.143	.184	.225	.265	–					
11	–	–	.016	.047	.078	.109	.141	.172	.203	.234	–				
12	–	–	.012	.037	.062	.086	.111	.136	.161	.185	.210	–			
13	–	–	.010	.030	.050	.070	.090	.110	.130	.150	.170	.190	–		
14	–	–	–	.010	.030	.050	.070	.090	.110	.130	.150	.170	.190	–	
15	–	–	–	.008	.025	.041	.058	.074	.091	.107	.124	.141	.157	.174	–

Table 1. Schedule of annual payment per $1 of the financial guarantee.

An initial payment must be made within 15 days of the plan's approval and subsequent payments, on the plan approval anniversary date. Depending on the duration of the mining activity, the operator has a 1, 2 or 3-year grace period before beginning to pay the guarantee. The regulation also allows operators to defer one or two annual payments. No subsequent deferment is, however, allowed if the deferred payments and annual payments are owing. In all cases, the amount required as a guarantee must be paid in full or in part before the onset of the last year of the mining activity.

For projects lasting less than 15 years, there is a possibility to move horizontally or vertically within the payment table to take into account variations in the duration of mining activities. As a result, adjustments to the amount payable as a financial guarantee and even refunds may be granted to respect this table.

When the rehabilitation plan is approved or revised, the operator need pay no guarantee immediately as long as the mine life exceeds 15 years. Otherwise, Table 1 applies as indicated.

Amounts spent on progressive rehabilitation work may not be used to replace the annual amount due of the financial guarantee. However, in the plan revision process, the total of the guarantee is readjusted. If the amounts spent on progressive rehabilitation are substantial, the plan revision date may be moved up to take into account any major changes and to modify the amount of the financial guarantee (M-13.1, s. 232.6).

Finally, the MRN can require, at the time of the approval of the rehabilitation plan, the payment of part of or the entire financial guarantee. This provision could be applied for mining projects involving major financial risks for the government.

FAILURE TO RESPECT THE PROVISIONS OF THE ACT

The MRN can enjoin a person to submit a rehabilitation plan including the description of a financial guarantee or even to do the work within the time periods that the Ministry prescribes (M-13.1, s. 232.8). If the person fails to do so, the MRN will resort to civil, administrative or penal measures. As a last resort, the MRN can have the required work carried out at the person's expense. The Ministry can use the financial guarantee to cover the expenses incurred.

Release from obligations

The company may be released from its obligations when rehabilitation has been carried out in keeping with the approved plan, when no sums are owing the MRN (since the MRN performed the work), and when the tailings no longer present any risk of acid mine drainage (M-13.1, s. 232.10). A person may also be released from his rehabilitation obligations when the MRN agrees to allow a third party to assume these obligations (M-13.1, s.232.10).

Abandoned tailings disposal areas

There are 153 abandoned tailing disposal areas in Québec, a dozen of which have been relinquished to the Crown. Of these sites, 55 may potentially generate acid mine drainage. The amendments made to the *Mining Act* confer on the minister a power to order the rehabilitation of abandoned sites provided that the person responsible is identified and that the latter is capable of assuming the costs of rehabilitating the accumulation areas. If this person cannot be found or is insolvent, the government could then take responsibility for the rehabilitation of the sites deemed most detrimental to the environment. The government could thus rehabilitate a surface area of approximately 1000 hectares.

Amendments made to the Mining Act give the Minister the power to order the rehabilitation of inactive sites, provided the party responsible for restoring the site has been identified as the one who produced the tailings. Section 232.11 of the Mining Act attempts to solve at least part of the problem related to inactive tailings disposal sites (tailings ponds and waste rock piles). Consequently, any company that has carried out exploration or mining of the same type as that currently contemplated by this legislation will, on the Minister's order, have to restore the site if it contains tailings. The MRN may prescribe the work it deems necessary as well as the time frame in which it is to be carried out. The Ministère de l'Environnement is always consulted first.

General mining site rehabilitation requirements

To define what the government means by "restoring the site to a satisfactory condition", a guide entitled "Guidelines for Preparing a Mining Site Rehabilitation Plan and General Mining Site Rehabilitation Requirements" was co-authored by the MRN (Ministère des Ressources naturelles) and the Ministère de l'Environnement (MRN, 1997). This document defines the objectives underlying the restoration of a mining site to a condition that is deemed "satisfactory". It also defines mining site rehabilitation requirements in four broad areas: visual appearance, physical stability, chemical stability and legal aspects. Finally, the guide also details the type of technical, economic and environmental data to be included in the rehabilitation plan. It can be consulted at the Internet site of the MRN at: www.mrn.gouv.qc.ca

The aim of the following sections is to specify the meaning that the MRN and the Ministère de l'Environnement give to the expression «satisfactory condition».

Definition of satisfactory condition

The aim of mining site rehabilitation is to restore the site to a satisfactory condition by :

- Eliminating health hazards and ensuring public safety,
  The rehabilitation must make it possible to eliminate all of the risks for the environment associated in particular with the presence of contaminated soils, solid waste, hazardous materials, etc. These elements posing a risk must be removed from the site or, depending on the case, be adequately confined.

The rehabilitation must also make it possible to ensure the safety of persons. Consequently, measures must be taken, in particular:

a/ to secure shafts openings, ventilation raise and access ramps by sealing or blocking them;

b/ to secure the perimeter of open-pit mines and that of underground worksites with surface openings (glory holes);

c/ to stabilize the slopes of waste rock piles and the dams of tailings confinement areas.

- Limiting the production and circulation of substances that could damage the receiving environment and, in the long term, trying to eliminate maintenance and monitoring,

  Limiting the production of substances that could damage the receiving environment involves, in particular, taking action directly at the source by controlling the parameters of the chemical reaction (entry of oxygen and water, the pH, the temperature and the presence of bacteria such as *Thiobacillus ferrooxydans*). The most common method for controlling and limiting the oxidation of sulphides is the use of cover material (wet, dry or other cover materials). Moreover, limiting the propagation of harmful substances involves the confinement of tailings by limiting on the one hand, the entry of water (cover material, diversion ditch) and, on the other, by collecting contaminated water (collection ditch) to ensure its treatment before discharging it in the effluent. Finally, over the long term, the rehabilitation measures put in place must seek to minimize the long-term monitoring and make it possible to leave the site to itself without risk of contamination of the neighboring environment or risks (danger) for the safety of the public.
- Restoring the site to a condition in which it is visually acceptable to the community,

  A visually acceptable condition takes into account the fact that the case involves a mining site where the traces left by the mining activity cannot be completely removed (ex: open-pit mine, waste rock piles and tailings confinement areas). By «acceptable to the community», we mean acceptable to the various government authorities, namely the MRN and the Ministère de l'Environnement. No public consultation mechanism is provided for in the *Mining Act*. Despite this fact, before approving the rehabilitation plan, the MRN will take into consideration the comments that it might receive from members of the local community.
- Reclaiming the areas where infrastructures are located (excluding the accumulation areas) for future use.

  Depending on the vocation that is chosen (recreation-tourism, residential, industrial or return to nature), the decontamination for the site of the buildings may vary according to the criteria set out in *Policy for the protection of soils and the rehabilitation of contaminated lands* (MEF, 1998) of the Ministère de l'Environnement. The aim of this policy is to restore contaminated soils from industrial environments. The fact of specifying that accumulation sites are not part of the site of infrastructures limits the field of application. Hence, tailings are not affected by the application of this policy.

Visual appearance of the site

All buildings and surface infrastructures must be dismantled unless they are required for other purposes. The foundations can be left in place, provided that they are covered with mineral substances that permit revegetation. Support infrastructures buried underground (tanks, pipes, etc.) may be maintained if so dictated by the mining site's future use. If not, they must be unearthed and removed from the site. Mining equipment, ore processing equipment and heavy machinery must be removed from the site. Also, if it is technically and economically feasible to do so, underground infrastructures and equipment must be removed from the site. Disposal of these infrastructures must comply with Ministère de l'Environnement Regulation respecting solid waste (MEF, 1981). In all cases, particular attention must be paid to areas where buildings, equipment, heavy machinery and the various infrastructures (electrical, underground, etc.) were placed in order to ascertain potential traces of contamination and if need be, decontaminate it.

The main mining site access road must be kept in good condition along with secondary roads used to monitor and maintain mining site structures. Where no longer necessary, the road surfaces, shoulders, escarpments, steep slopes, regular and irregular benches, etc. must be rehabilitated in order to prevent erosion.

All areas affected by mining activities must be revegetated to control erosion of the accumulation areas and restore the site's natural condition. However, if all or part of the mining site cannot be revegetated, the proponent must prove that it is nevertheless in "satisfactory condition". This could be the case for an abandoned waste pile or a waste pile in activity for which the nature of the tailings makes revegetation very costly in relation to the environmental gain that might ensue.

Finally, the characteristics of this vegetation should resemble that of the natural environment except for the early growth which form the bottom layer. Vegetation must be self-sufficient six years after planting and require no fertilizing or maintenance.

Physical site stability

Physical site stability is related primarily to underground (shafts, chimneys, surface pillars) and open pit mining, tailing ponds, waste rock piles and water collection systems.

Surface opening

Excavations (bulk sampling) must be backfilled unless they constitute an essential attraction of the geological heritage to be conserved and do not constitute a danger to public safety. In this case, a fence meeting MRN regulatory standards (M-13.1, r. 1, Chap. X) or an embankment with a ditch in front must be built. Open-pit mines must be backfilled if it is techni-

cally and economically feasible to do so or flooded. Otherwise, all access roads must be closed off and a fence or an embankment with a ditch in front must be built. The gate (fence or embankment) should be at least fifteen metres from the excavation (horizontal distance) or more if geological considerations so warrant. Signs should be posted on the gate at reasonable intervals to ensure that it is well visible. The entire wooded surface between the gate and the embankment should be thinned (cut understorey) and cleaned. When an open-pit mine is flooded, the safety measures mentioned above must be put in place until the mine has been filled with water.

The embankment must be two meters high and have an equivalent crest line. It must be made of unconsolidated materials or inert mineral substances. If applicable, it must have a ditch (minimum 2 m wide and 1 m deep) in front of it.

All surface openings used for underground mining activities must be sealed off as stipulated in the *Regulation respecting mineral substances other than petroleum, natural gas and brine* (MRN, January 1996). Underground worksites with surface openings should be backfilled and levelled to blend in with the surrounding topography. If this option is not technically or economically feasible, a fence respecting MRN regulatory standards must be built.

The surface pillar must ensure long-term structural stability after mining activities cease. He must sustain its own weight and, if applicable, the weight of unconsolidated deposits, watersheds and all other surface loads. No sudden rupture of the chimney must occur. Otherwise, if a chimney is formed, it must be stopped and filled up before reaching the surface. For which the long-term stability of the pillars cannot be guaranteed, a fence meeting MRN regulatory standard must be built around the problem area.

Tailings and waste piles

The stability of the waste rock piles and tailing confinement areas is a major concern of every Government. It is also an international concern as the International Committee on large dams published a guide in 1989 on the safety of mining waste-rock dams. The Government of Québec is no exception to the rule, and for more than 10 years now, new measures have been put in place by the MRN to better manage the storage of tailings during operations and to establish criteria for the long-term stability once mining activities have come to an end.

Following the flooding that occurred in the Saguenay region (Québec) in 1996 caused by a devastating spring flood during which numerous rivers overflowed their banks and caused considerable material damage, a commission of inquiry was set up by the Government of Québec to study all of the aspects surrounding the management of water retaining dams (Québec, January 1997). The recommendations of this committee included tighter control over these works, which led to the tabling of a preliminary bill on the safety of dams and the creation of an exhaustive inventory of all water retaining dams (more than 10,000 in all). One of the recommendations dealt with the adoption of the guidelines concerning the safety of dams of the Canadian Dam Safety Association. These guidelines, although they are still in draft form, are nonetheless a reference work of the mining industry.

For its part, the Canadian Mining Association published in September 1998, a guide for managing tailings confinement areas (CMA, September 1998). This guide is available in French, in English and in Spanish at the following web site: www.mining.ca.

Tailings and sedimentation pond containment structures must not deteriorate, erode or collapse under wind/water, frost/thaw, man-induced erosion, annual ice build-up, or due to root damage, beaver dams, animal burrows, earthquakes, etc. Waste rock piles must be stable in the long term to prevent erosion, subsidence or collapse. In all cases, structures must be designed to require minimal maintenance and monitoring.

For the evaluation of the stability of the various works, the minimum useful life span must be 50 years in the case where the tailings are neutral or alkaline and 100 years where the tailings produce acid mine drainage (AMD). When the works are located far from inhabited areas, the static safety factor must exceed 1.3. When they are located near inhabited areas, this factor must exceed 1.5.

As for the dynamic safety factor, the seismic coefficient is obtained from the Geological Survey of Canada. In the case where the tailings are neutral or alkaline, an annual exceedance probability of 10 % in 50 years (1/476) must be used. For tailings that produce AMD, a probability of 10 % in 100 years (1/1000) must be employed. The pseudo-static safety factor must exceed or be equal to 1.1-1.3 according to the tailings confinement area design method (downstream, central or upstream methods) and according to the location of the work in relation to seismic zones.

During rehabilitation work, it may be necessary to set up water collection systems to allow for the channeling of contaminated percolating water and the diversion of non-contaminated runoff water. These works must meet the stability criteria listed above.

Chemical stability of materials

Using proven techniques, tailings and sedimentation pond rehabilitation must allow the production of all types of contaminants (including chemical reactions generating acid waters) to be controlled directly at the source, prevent contaminant flows using containment structures, uncontaminated water diversion ditches and contaminated water collection systems, and ensure contaminant collection and treatment in order to meet Ministère de l'Environnement requirements governing mining effluents.

The rehabilitation scenario must correspond to the method best adapted to the circumstances which implies that it must represent the best long-term cost/environmental benefit compromise. An evaluation of the long-term risks must be made to check the impacts.

Use of effluent-treatment facilities does not constitute rehabilitation, but a temporary measure to be used while striving to meet Ministère de l'Environnement requirements, develop technically and economically viable rehabilitation methods or while waiting for the rehabilitation measure put in place to reach its maximum efficiency and until the output water can be treated by a passive treatment or discharged directly in the environment.

Legal aspects

Legally speaking, various rehabilitation-related requirements correspond to the integral application of the regulations in force. MRN regulations targeting the safety of surface openings and petroleum products apply. Various Ministère de l'Environnement regulations and guidelines apply also to mining activities from start to finish (mining effluents, sanitary facilities, disposal of hazardous waste and solid waste, contaminated soil policy).

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Mining effluent must meet Ministère de l'Environnement requirements at all times. Directive 019 (MEF, May 1989) which specifies the standards that must be met during operations also stipulates the requirements pertaining to the concentration of metals, pH and suspended solids that mining effluents may contain. However, these criteria are progressive in nature and the criteria that will have to be met are those that will be in effect at the time of the mine closure.

Hazardous waste management is governed by the Hazardous Waste Regulation (Q-2, r.3.01) (MEF, 1997). This regulation stipulates the way in which substances deemed to be hazardous must be managed and eliminated. No hazardous substance must remain at the mining site after the final cessation of activities. However, when no treatment or elimination technique exists, storage on site, in accordance with the requirements of the Ministère de l'Environnement, can be authorized until a suitable destruction technique becomes available. Waste oils not containing PCBs can be sent to a waste transfer centre or to an authorized recycling or reutilization site. The other hazardous substances must be taken to an authorized hazardous waste elimination, treatment, recycling or reutilization site. It is important to point out that tailings are not hazardous substances within the meaning of the *Environment Quality Act*.

The management of solid waste is governed and its elimination must meet the standards of the *Regulation respecting solid waste* (Q-2, r.3.2) (MEF, January 1993). This regulation excludes vehicle frames, hydrocarbon soaked sands, tailings, sludge and hazardous waste within the meaning of the *Regulation respecting hazardous substances*. Solid waste can be sent to a landfill site, a trench sanitary landfill or a dry disposal site specifically authorized for the mining site (Q-2, r.3.2, section IX). In special cases (Q-2, r.3.2, s.133), the disposal of solid waste may be authorized in a place other than those places mentioned above.

The aim of *the policy for the protection of soils and the rehabilitation of contaminated lands* (MEF, 1998) of the Ministère de l'Environnement is to ensure that contaminated lands are not detrimental to health and to the environment, and that they are compatible with the future use of the site. Its implementation is part of a process that seeks to rehabilitate soils contaminated by mining activities, with the exception of tailing accumulation areas and authorized waste disposal sites.

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The *Regulation respecting mineral substances other than petroleum, natural gas and brine* stipulates the securing measures that must be put in place on the various accessible openings (ramp, shaft, ventilation raise, underground worksites with surface opening, etc.) (M-13.1, r.1, s. 87 to 96) (MRN, January 1996).

The *Regulation respecting the use of petroleum products* (U-1.1, r.1) (MRN, 1991) stipulates measures for the rehabilitation of petroleum product storage sites. It refers to every hydrocarbon mixture used as fuel (gasoline, diesel), heating fuel (light and heavy heating oil) and lubricant (new and waste oil, grease). In terms of rehabilitation, competent persons must dismantle petroleum product tanks and the parts of the storage system, and the site must be decontaminated in accordance with the requirements of the Ministère de l'Environnement.

CONCLUSION

The mining industry subscribes to the sustainable development concept. It has put in place an environmental policy the measures of which seek to ensure proactive cooperation with the government, the implementation of wise and economically feasible practices in the absence of standards and, finally, support for research to increase scientific knowledge. This policy has resulted in the putting in place of legal measures surrounding the rehabilitation of mining sites and which were outlined in this presentation, in a better planning of the rehabilitation work from the start of the mining activities and in the increased use of the paste fill technique that offers better support for underground work while maximizing the management of tailings. Finally, this policy has led to the industry's proactive participation in the activities of the MEND (Mine Environment Neutral Drainage) and MEND 2000 program in addition to contributing as a partner to the creation with the MRN of the pre-competitive mineral research consortium (COREM).

Since 1997, the mining industry has devoted more than CDN$30 million to the rehabilitation of mining sites. The MRN, for its part, has spent more than CDN$4 million over the last five years to rehabilitate 80 % of the sites relinquished to the crown. We expect to spend $6 million over the next 3 years to complete this work.

Finally, the mining industry's compliance rate with government standards on mining effluents rose from 87 % in 1989 to more than 99 % in 1997 which shows the good performance of the mining industry.

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