

4. Implementation Plan

4.1 Identification of Work Packages

The work packages identified for the Tailings Area rehabilitation program are listed in Table 4.1.

TABLE 4.1
IDENTIFICATION OF WORK PACKAGES

Package I.D.	Work Package Description
TA-WP#1	Contractor set-up, access routes preparation, construction of washpad and mobile washer, installation of surface water control items, and temporary road construction to Tailings Area. Clearing and grubbing the perimeter of the Tailings Area, especially along the northern edge to allow for placement of and grading for the interceptor ditch. Clearing and grubbing to remove trees from the tailings surface and from the rock outcroppings within the Tailings Area.
TA-WP#2	Placement of the rip rap and geotextile at the toe of the tailings dams walls. Placement of the geotextile along the slope of the crushed limestone berm portion of the dams walls and on the crushed limestone covering the tailings.
TA-WP#3a	Capping the tailings surface and the dam slopes to the toe of the dams walls with 0.3 m clay, 0.3 m sand, 1.0 m silty clay loam, and 0.15 m topsoil, then seeding with grass. Construction of the interceptor ditch for the north and east portion of the Tailings Area and the drainage ditches at the south portion of the Tailings Area that will occur towards the end of the earthworks and prior to planting the poplar plantation since it will be incorporated into the final cover.
TA-WP#3b	Installation of hybrid poplar trees (cuttings or bareroot) and the irrigation system.
TA-WP#4	Installation of groundwater collection wells, pumps, and power supply to the pumps. Construction of heated enclosures and overland piping from the Tailings Area to the equalization pond.

4.2 Sequencing of Work Packages

In general, the work packages would be completed in the order listed in Table 4.1. However, the opportunity exists for sub-components of the work packages to be completed concurrently with the closure of other site areas. This will be considered further in the development of the integrated site-wide cleanup plan.

Studies have determined that the marginally contaminated material from Young's Creek cannot be used as cover material in the Tailings Area without creating an adverse impact, as described in *Leaching Geochemistry of Young's Creek Clay Materials*, Draft Technical Memorandum (CH2M HILL, April 2004).

The main sequencing for the work proposed for the Tailings Area relates to the collection and treatment component. The installation of piping across the Industrial Area to convey the contaminated seepage and groundwater to the equalization pond will need to be delayed until the Industrial Area capping is completed since the piping will travel across this area on an overhead pipe rack.

4.3 Anticipated Construction Impacts and Mitigation Measures

Anticipated construction impacts and mitigation measures are summarized in Table 4.2.

TABLE 4.2
ANTICIPATED CONSTRUCTION IMPACTS AND MITIGATION MEASURES

Construction Impacts	Mitigation Measures
Clearing and grubbing of trees and shrubs during site preparation	Altered areas will be revegetated with poplar plantation and grasses.
Suspended particulates in air from heavy equipment/vehicles adversely affecting air quality	Dust suppression methods will be utilized on an “as needed” basis.
Vegetation removal for temporary road construction or existing road upgrades to accommodate heavy vehicles	Roads not required for the future OMM of the site will be excavated, backfilled with appropriate material and revegetated to blend in with existing cover/cap requirements.
Suspended sediment in surface water	Diversion dams/trenches, and geotextile silt fencing will be used to isolate surface water flows from active excavation areas. Sediment settling/retention ponds may be required.
Rock blasting during trench and ditch installation (if required)	Performed in accordance with the applicable regulations with blasting mats.

4.4 Implementation Schedule

An implementation schedule for the four work packages is presented in Table 4.3.

TABLE 4.3
IMPLEMENTATION SCHEDULE OF WORK PACKAGES

Package I.D.	Work Package Implementation Schedule
TA-WP#1	Contractor set-up, prepare access routes, construct washpad/mobile washer, surface water control installation, construct temporary road to Tailings Area, and clear and grub in Year 1.
TA-WP#2	Placement of rip rap and geotextile in Year 1.
TA-WP#3a	Install cap (sand, HDPE perforated collection pipe, soil, clay, grass cover), interceptor ditch and drainage ditches in Year 1 and maintain during the following three years to help minimize tree mortality.
TA-WP#3b	Plant poplar plantation and install irrigation equipment in Year 2.
TA-WP#4	Drill groundwater collection wells in Year 2, install electrical service, and pumps and construct heated enclosure. Install overland piping in subsequent year(s) to coincide with completion of activities in other areas that piping installation is dependent on (i.e. Industrial Area).

Figure 4-1 illustrates the proposed project schedule.

**Figure 4-1
Proposed Project Schedule**

Deloro Mine Site Cleanup, Tailings Area Rehabilitation Closure Plan Implementation



		Year 1				Year 2			
Work Package ID Number	Description	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
	Project Initiation								
TA-WP#1	Site Preparation		█						
TA-WP#2	Rip Rap and Geotextile Placement		█						
TA-WP#3a	Cap Installation (clay, sand, HDPE perforated collection pipe, fill material, and topsoil) and Grass Planting Interceptor Ditch Installation Drainage Ditches Installation		█	█	█				
TA-WP#3b	Irrigation System Installation Poplar Plantation Installation						█	█	
TA-WP#4	Seepage/Groundwater Collection System and Overland Piping Installation								█

4.5 Cost Opinion for Each Work Package

The costs required to implement the recommended rehabilitation alternative for the Tailings Area of the Deloro site were developed previously in the report *Deloro Mine Site Cleanup – Tailings Area Rehabilitation Alternatives, Final Report* (CH2M HILL, October 2003). The costing developed for the above report has been used to assign a cost estimate for each of the work packages as shown in Table 4.1. Dam stability assessment work completed since that time has resulted in an increase in area of approximately 6,000 m² to be covered along the slope of the tailings dams walls (8 percent increase).

The updated costs in Table 4.4 take into consideration the following information and data which has become available since the alternatives report was finalized in October 2003.

- It will be necessary to increase the Tailings Area cap by approximately 0.6 ha in order to follow the crushed limestone berms to the adjacent bedrock surface.
- The depth of the silty clay loam layer will be reduced to 1.0 m from 1.5 m (see Section 3.4.1).
- Suitable clay has not been confirmed locally. It has been conservatively assumed that all clay (i.e. 100 percent) will have to be imported from a non-local source, compared to 50 percent as was indicated in the Tailings Area alternatives report.

TABLE 4.4
ESTIMATED COSTS FOR IMPLEMENTING RECOMMENDED ALTERNATIVE

Work Package Identification #	Description	Estimated Cost* (2004 dollars)
Capital Cost Items		
TA-WP#1	Site Preparation	\$283,500
TA-WP#2	Placement of Rip Rap and Geotextile	\$313,600
TA-WP#3a and 3b	Installation of Engineered Cap (clay, sand, HDPE perforated collection pipe, silty loam, topsoil, and grass) and Interceptor and Drainage Ditches; Installation of Poplar Plantation and Irrigation System	\$6,694,100
TA-WP#4	Tailings Seepage and Groundwater Pumping and Piping System	\$216,000
Total Capital Costs		\$7,507,200
OMM Cost Items (Annual [Weighted])		
TA-OMM#1	OMM Program	\$88,020
Total Annual (Weighted) OMM Costs		\$88,020
Net Present Value OMM Costs		\$1,293,200**
Net Present Value of Capital and OMM Costs		\$8,800,400

*All costs have been developed using 2004 pricing and do not include an escalation factor.

**Net Present Value (NPV) of Annual OMM Costs using an effective interest rate of 5 percent, and a 20-year planning horizon.

The net present value (NPV) costs presented above are the sum of the capital cost and the net present value of the OMM costs. The annual OMM costs have been transformed to a net present value assuming an effective interest rate of 5 percent and a planning horizon of 20

years. The effective interest rate includes inflationary effects. It should be noted that OMM effort and costs will be required beyond the 20-year horizon. The 20-year period was selected based on the assumption that it is a reasonable period for budgetary planning purposes.

The total estimated capital cost to rehabilitate the Tailings Area is \$7,507,200 in 2004 dollars with annual (weighted) OMM costs of \$88,020. The NPV of this remediation work, assuming an effective interest of 5 percent and a planning horizon of 20 years is \$8,800,400.

The costs provided in Table 4.4 have been revised to account for the increased area of capping. The capital costs presented in Table 4.4 include overhead and remote location costs, the federal Goods and Services Tax (GST), a 15 percent contingency for the capital costs, a 5 percent contingency for the OMM costs, and the cost of insurance and various construction bonds associated with the work. The costs presented are expected to have accuracy on the order of +/-25 percent. A breakdown of the estimated costs is provided in Appendix A. The major assumptions used in making this cost estimate are also provided in Appendix A. The costing in Appendix A has been completed at the preliminary design level and should be considered as a "cost opinion" to assist in budgeting. An appropriate allowance should be included in any budget planning to account for cost escalation factors for work after 2004. Costs can further be refined once the recommended alternative has been accepted and the detailed design and approach have been finalized.

A cost estimate for replacement monitoring wells, associated with post-remediation groundwater monitoring, is not included in Table 4.4, since the number of groundwater monitoring locations will require further evaluation.

4.6 Health Hazard Assessment

A document entitled *Deloro Mine Rehabilitation Project – General Health and Safety Plan (GHASP), Final Report* (CH2M HILL, January 2002) has been developed to identify the main hazards and to provide a basis for the health and safety protocols.

The GHASP identifies the following health hazards associated with the Deloro Mine Site, that could be encountered while undertaking site inspections, site investigations, and remedial cleanup:

- Arsenic and arsenic compounds, other metals and silica
- Radiological hazards
- Heat and cold stress
- Buried utilities
- General physical (safety) hazards
- Biological hazards
- Chemicals existing at or brought onto site

The GHASP outlines and describes appropriate procedures and protocols to effectively deal with the above hazards associated with the Deloro Mine Site. The GHASP addresses: hazard evaluation and control procedures and protocols (including action levels), personal protective equipment to be used, air monitoring protocols and specifications, decontamination procedures and protocols, spill containment procedures, confined space entry procedures, emergency response plan, and emergency contacts.

Addenda will be added to the GHASP to address hazards associated with specific work packages identified in this and the other three Closure Plans.

The health hazard to workers will be greatest during construction of the engineered cover due to possible sinking into the soft underlying tailings. As previously noted, confirmation that heavy construction equipment can be supported on the Tailings Area will be evaluated during the detailed design stage. A hazard potential is also associated with the drilling of the groundwater collection wells at the east and west tailings dams walls due to exposure to buried tailings materials that may be radioactive (see below). Pump startup may generate a health hazard due to leaks in the piping or pumps that could spray onto adjacent workers.

Radiological hazards result from radioactive slag, some tailings-like material in the Industrial Area, and sediments in the onsite Young's Creek Area contaminated by radium and uranium tailings eroded from the Tailings Area. The slag represents an external hazard from radiation fields, whereas the tailings-like material and sediments represent both external hazards due to radiation fields and internal hazards from potential ingestion and/or inhalation during the handling activities. Although ambient radiation fields in most of the work areas are expected to be below 1 $\mu\text{Sv/h}$, standard radiation protection procedures as described in the GHASP will be employed to minimize doses to workers during the various remediation activities. Routine radiation field monitoring will be used to identify those areas in which radiation protection procedures must be implemented. Contamination control procedures will also be implemented as described in the GHASP. Decontamination procedures are outlined in Section 4.7.4 of this Closure Plan.

4.7 Environmental and Community Health Protection Plan

Potential receptors that could be affected by of the cleanup of the Deloro Mine Site include workers involved in the site cleanup, residents in the Village of Deloro, residents and cottagers along the Moira River downstream of the site and vehicular traffic along Highway 7 near Young's Creek (in the case of impacted materials to be transported onsite from offsite Young's Creeks across Highway 7). The following Environmental and Community Health Protection Plan (ECHPP) identifies potential risks associated with the cleanup of the Deloro site and recommends appropriate mitigation measures. Protection of workers involved in the site cleanup was addressed in Section 4.6.

The disturbance of potentially contaminated materials during remedial activities and the possible loss of contaminants from the work area depend to a high degree on the remedial methods and related physical activities undertaken during site rehabilitation. Since the transport of contaminants is most easily controlled at the source, the remedial activities selected for the site have been chosen based on the ability to minimize and control the disturbance, spread and loss of contaminants from the work area. Additional actions can be taken to further limit the spread and loss of contaminants from the work area and potentially offsite. These include measures to control dust, noise, odours, surface water runoff, surface water run-on, and erosion, as well as the use of appropriate equipment and personnel decontamination procedures. Each of these measures, which are discussed briefly below, will be undertaken prior to and during implementation of the remedial activities. Odour control is not discussed since it is not expected to be of concern during implementation of remedial activities at the Deloro site.

It should be noted that this overview provides some of the key aspects associated with the mitigation and monitoring of potential offsite impacts resulting from remedial activities at the Deloro site. The finalized details and procedures will be included in the contract documents and specifications associated with the rehabilitation of the Deloro site and the execution plans proposed by the remedial contractors who are selected to complete the cleanup work.

4.7.1 Dust Control and Air Monitoring

Effective dust control at sites undergoing remediation is best addressed via the development, establishment, implementation and enforcement of a fugitive particulate emission control program. The development and implementation of such a program is generally the responsibility of the remedial contractor and is required to be reviewed and approved by the owner and/or the consultant. The fugitive particulate emission control program includes a description of the procedures relating to the handling of materials, air monitoring and dust control, and is documented in the contractor's execution plan for the site remedial activities. The remedial contractor is required to take all precautions necessary to minimize and control the generation of dust and under no circumstances will unacceptable levels of dust be permitted to be generated and/or transported offsite.

Key aspects of a fugitive particulate emission control program include:

- Carrying out remedial activities that involve disturbance of material, such as excavation, during good weather conditions in order to minimize the loss of materials by wind.
- Movement of materials directly to their designated location, rather than handling several times, in order to minimize the generation of dust (i.e. multiple handling tends to break materials into smaller and smaller pieces which are more likely to be entrained by wind).
- Ensuring adequate equipment and personnel are available at the site at all times to immediately clean up any spilled material, whether it be of a small or large amount.
- An inspection program to monitor the condition of onsite and offsite roads, materials piles, vehicles, etc.
- The use of tarps to cover materials which are likely to generate dust.
- The use of dust suppressants to control dust associated with roadways, work areas, stockpiles and other possible sources. Materials used to assist in dust suppression might include water, calcium chloride or latex binders. The frequency of application of dust suppressants is generally on an as-needed basis.
- Regrading of unpaved roads, as required, to keep silt content below 10 percent, and the sweeping of paved roads.
- The use of tarps on trucks used to transport materials onsite and offsite.
- In the case of the Deloro site cleanup, air monitoring both upwind and downwind of the site will be carried out in order to confirm that dust control measures are effective, and to ensure that any potential offsite air quality impacts caused by remedial operations are minimized. Monitoring should be carried out for dustfall and total suspended particulate matter (TSP). Monitoring for arsenic and other selected metals should also be considered. Although in the handling of radioactive tailings, radioactive contaminants

may become airborne, the expected levels will be considerably less restrictive than those for arsenic at similar TSP concentrations.

- The frequency of monitoring and location of monitoring stations at the Deloro site will be determined following the development of the final integrated cleanup plan, and the review of the contractor's execution plan, the proposed remedial activities and meteorological conditions. Typically, TSP is measured using standard high-volume samplers and a daily (24-hour) average determined. Depending on the size of the site, samplers are typically located at four upwind/ downwind perimeter sites during each work day. Their location is subject to change based on the location of remedial activities, but they are generally placed at the furthest possible distance downwind of the site within the property line. Standard dustfall jars are used to obtain dustfall measurements, which are typically determined based on a 30-day integrated measurement of dustfall loadings at four perimeter locations.
- Meteorological measurements (wind speed and direction) may also be required to be carried out in conjunction with the air monitoring program. Typically, hourly and daily average wind speed and direction at one localized site could be required during site activities.
- The MOE Ambient Air Quality Criteria (AAQC) for dustfall is 7 g/m² (30-day AAQC) and for TSP is 120 µg/m³ (24-hr AAQC). The AAQC for TSP and dustfall were determined with nuisance effects being the limiting factor. Health effects are not a concern until TSP levels are several times higher than defined by the AAQC, unless elevated concentrations of arsenic and/or other metals are present in the dust. Levels in excess of these criteria, on the basis of property line monitoring results, are considered unacceptable. In instances where background or upwind concentrations exceed these criteria, additional contribution to the parameter is also normally considered unacceptable.
- Monitoring of ambient air quality prior to initiation of remedial activities at the Deloro site is recommended and should be carried out on several occasions and under a variety of conditions in order to establish background air quality both onsite and offsite.

4.7.2 Noise Control

While noise is expected to be generated at the Deloro site during cleanup as a result of mobile sources such as truck and vehicular traffic, as well as equipment sources such as excavators, bulldozers, compactors, generators, pumps and air compressors, conformation with regulatory requirements is not expected to be a major problem. The development and implementation of a noise monitoring and control program is generally the responsibility of the remedial contractor and is required to be reviewed and approved by the owner and/or the consultant prior to initiation of any site work. The contractor is usually required to provide written details of the noise monitoring and control program in the execution plan to ensure that local requirements are met.

Typical aspects of a noise monitoring and control program include:

- The contractor will be required to take all precautions necessary to minimize noise and under no circumstances will unacceptable levels of noise be permitted to impact offsite residents/ property owners.

- The contractor is to conduct all work using appropriate construction methods and equipment so that noise emanating from the site remains at acceptable levels.
- The contractor is required to obtain approval from the owner and/or consultant prior to conducting any site activities between the hours of 6:00 p.m. and 7:00 a.m.
- The contractor will be required to undertake noise monitoring if deemed necessary.
- MOE noise guidelines for landfill operations suggest that a criterion of 50 dBA during the hours of 7:00 a.m. and 7:00 p.m. should be established for the closest residential location. A similar guideline may be suitable for the cleanup activities at the Deloro site.

4.7.3 Surface Water Protection

The control of surface water is required in order to minimize the contact of water with potentially contaminated materials and thus reduce the generation of contaminated water. This can be achieved through the control of surface water runoff from the work area, as well as the control of surface water run-on into the work area. Surface water is also required to be controlled in order to minimize erosion and prevent the offsite transport of potentially contaminated water and sediment to Young's Creek and the Moira River. Specific details relating to the control of surface water will be dependent on the final engineering designs for the cleanup of the site.

The development and implementation of a work area surface water control program is generally the responsibility of the remedial contractor and is required to be reviewed and approved by the owner and/or the consultant. Generally, the remedial contractor is required to take all precautions necessary to minimize the generation of sediment and potentially contaminated surface water and may be required to collect and treat any such water.

Key aspects of a work area surface water control program include:

- The use of geotextile silt fencing, sand bags and/or straw bales to reduce sediment transport.
- The construction of surface water diversions, comprised of swales and sumps or clay berms, to re-direct and/or collect surface water runoff and run-on.
- The collection and treatment of all potentially contaminated water, including water used to decontaminate equipment, surface water and water generated from the dewatering of excavations.
- In the case of the Deloro site cleanup, surface runoff characteristics (i.e. quantity, quality and direction of flow) of the site should be addressed prior to initiation of remedial activities. Additionally, an assessment of the quality of water in existing site drainage ditches and channels, including those that result in both run-on and runoff, standing water and natural water (i.e. any adjacent natural streams, wetland areas, and the Moira River) should be undertaken prior to remedial activities (if not addressed through current site monitoring). The water quality assessment should include the sampling and analysis of water for total suspended solids, arsenic, and metals.
- Once a decision on the activities planned for the Deloro site is made, a site-wide surface water quality monitoring program should be developed for implementation during the cleanup.

4.7.4 Decontamination Procedures

In order to prevent the transfer of contaminants from the work area, all equipment, materials, and supplies that come into contact with potentially contaminated materials must be decontaminated prior to removal from the work area. The development and implementation of equipment decontamination procedures is generally the responsibility of the remedial contractor and is required to be reviewed and approved by the owner and/or the consultant. The remedial contractor is required to take all precautions necessary to minimize the transfer of contaminated materials from the work area. Under no circumstances is the transfer of non-decontaminated equipment and materials from the work area permitted.

The key aspects of a decontamination program include:

- Decontamination of equipment and materials that have come into contact with potentially contaminated materials, completed by the contractor prior to the removal of equipment and materials from the work area.
- Equipment decontamination using water or steam facilities to decontaminate tracks, sprockets, tires, axles, buckets, and trailers used in the transport of materials.

In general, the need for extensive decontamination during remediation of the Tailings Area is not envisaged since the tailings will not be disturbed.

4.7.5 Emergency Response and Preparedness

CH2M HILL will develop a site-specific emergency procedures plan including requirements and information relating to emergency contacts, directions to the nearest hospital, spill and fire control, emergency communications, emergency response such as for a spill or fire, medical emergency, notification, and reporting. All site contractors will be expected to be familiar with and implement the site-specific emergency procedures plan as required. Much of this information is already contained in the GHASP (CH2M HILL, January 2002).

4.7.6 Associated Considerations and Activities

Several issues associated with the mitigation of offsite impacts include:

- CH2M HILL will develop a site Transportation and Emergency Response Plan (TERP) to outline the procedures and protocols for addressing vehicular accidents and spills of hazardous and non-hazardous materials. Procedural controls will limit the speed of vehicles and determine safe routes.
- The development and implementation of specific work practices associated with contamination, decontamination, and clean work zones.
- In addition to the existing perimeter fencing, the development and implementation of a site security plan including aspects such as additional fencing of work areas, warning/caution signs, security patrols, control of site staff and visitors, etc.
- The use of a qualified environmental contractor who is experienced in similar types of projects, has a good safety and environmental record, and whose employees are experienced and qualified.

4.8 Other Operational Procedures

Other operational procedures are associated with the operation of the ATP in the Industrial Area. As detailed in Section 3, contaminated seepage and groundwater associated with the Tailings Area will be pumped to the equalization pond for treatment at the onsite ATP. The operational procedures associated with the ATP are contained in the Industrial Area Closure Plan.

5. Operation and Maintenance Requirements

Operation and maintenance requirements are discussed in this section and monitoring requirements are discussed in Section 6. A detailed OMM plan should be established for the Tailings Area facilities following implementation.

OMM efforts under this Closure Plan relate to the ongoing operation of the seepage and groundwater collection and conveyance system, and the maintenance of the hybrid poplar trees. Other maintenance efforts will include periodic maintenance of the engineered soil cap, the stormwater interceptor ditch, and the surface water drainage ditches.

5.1 Seepage and Groundwater Collection and Conveyance System

OMM efforts under the recommended alternative will be associated primarily with the ongoing operation of the seepage and groundwater collection and conveyance system. Routine inspection and maintenance of the pumps will be necessary. The overland piping system may require periodic flushing and cleaning. Pipe integrity testing by regular pressure testing will be required. Regular pump maintenance, such as routine seals replacement, will be as specified by the pump manufacturer. The possibility exists that this operation might be phased out with time as the water infiltration control measures (i.e. poplar trees and clay cap) take effect. Seepage production is predicted to be reduced sufficiently that the seepage contribution will be negligible, or that seepage volume and contaminant loading will be reduced such that a natural treatment system can be installed to provide long-term passive water quality improvement.

The OMM costs of the ATP for treatment of the contaminated seepage and groundwater from the collection wells at the Tailings Area dams walls will be included in the Industrial Area Closure Plan. These efforts have not been duplicated in this evaluation. It is anticipated that the volume of leachate requiring treatment from the Tailings Area dams walls will be small relative to the rated capacity of the ATP (<10 percent). If the onsite ATP is phased out in the future, removal of any leachate from the collection system and transport to an offsite treatment facility will be required if it cannot be treated onsite using a natural treatment system.

5.2 Poplar Trees

In the short-term (first three years), maintenance requirements will include watering of planted/treed areas using the installed irrigation system as required to maintain plantation health, replacing plants as needed, checking for tree health, and addressing rodent activity (beaver and vole controls). Mowing between tree rows will reduce competition among the trees and expose rodents to predators. These activities will help to ensure that the freshly vegetated areas have a low mortality rate and that vegetation density increases to the required level.

5.3 Interceptor and Drainage Ditches and Soil Cap

Other maintenance efforts will include periodic maintenance of the engineered soil cap, stormwater interceptor ditches, and the surface water drainage ditches to repair any erosion damage and areas of vegetative stress.

5.4 Perimeter Fencing

The perimeter fence for the mine site is outside the Tailings Area and will be dealt with in the other Closure Plans.

6. Monitoring Program

A comprehensive monitoring plan will be required to determine the effectiveness of the implemented remediation measures.

The current site-wide monitoring program (i.e. surface water, groundwater, pumping system, ATP inlet and outlet) will be extended to monitor site conditions and the effectiveness of the site rehabilitation measures. This will include the existing monitoring wells, the surface water sampling stations and the operational sampling stations, as well as time domain reflectometry (TDR) measurements of the cover and cap elements. Provided that the monitoring confirms the effectiveness of the closure measures in reducing the flux of arsenic and heavy metals reaching the Moira River and Young's Creek, the frequency of the sampling may be gradually reduced.

Water level measurements will help determine whether the water table effectively drops at the Tailings Area dams walls as a result of the groundwater extraction measures as well as the reduction of infiltration. It is expected that groundwater extraction and treatment will probably not vary in the short term and that dissolved contaminant concentrations values will likely stay significant until the new hydrogeological regime is established. Data obtained from the surface water monitoring stations will demonstrate the effectiveness of the new engineered and vegetated cap.

Periodic monitoring is anticipated to be required during the following two phases:

- Phase 1: Post-Construction Performance Assessment – to assess the potential exposure pathways (seepage and groundwater) and whether or not these are significant
- Phase 2: Long-Term Monitoring and Maintenance (repairs to cover, cleaning of groundwater collection system, poplar tree care, etc.)

Monitoring programs that will likely be prescribed for the Tailings Area are summarized in Table 6.1.

The results of monitoring during closure activities should be documented in a Closure Report. During the post-closure period, annual reports should be prepared that document the results of monitoring activities for that year, discuss past trends in the data and forecast trends for the future.

TABLE 6.1
MONITORING PROGRAM

Type of Monitoring	Description	Duration	Frequency
Poplar Cap Performance	Visual inspection of vegetative cover, erosion problems, tension cracks, seeps, TDR measurements	Indefinitely following Tailings Area capping	Semi-annual for Years 0 to 3 Annual after Year 3
Water Quality	Sampling and analysis of surface water at key selected locations	During the ditch excavation and well drilling stage of the project	Weekly during excavation
Water Quality	Sampling and analysis of groundwater and surface water at key selected locations Sampling and analysis at seepage and groundwater collection wells	Indefinitely following Tailings Area capping	Semi-annual for Years 0 to 5 Annual after Year 5
Pumping and Conveyance	Visual inspections and pressure testing	Throughout the pumping period	Monthly (with alarms in place)
Biomonitoring	Vegetation tissue and invertebrate sampling, soil moisture monitoring, visual observations	Indefinitely following Tailings Area capping	Annually for Years 0 to 5 Once every five years for the next 20 years Once every 10 years thereafter
ATP Influent/ Effluent Quality	Sampling and analysis of influent/effluent from ATP	Refer to the Closure Plan for the Industrial Area	Refer to the Closure Plan for the Industrial Area

The various components associated with the monitoring program are described in detail below.

6.1 Poplar Cap Performance

During construction of the engineered soil cap, compaction testing will be undertaken to verify compliance with compaction standards described in the specifications. After construction is completed, the newly modified site will be monitored for erosion, slumping, and dam integrity.

Long-term monitoring of the physical stability of the vegetated cover will be required. Physical monitoring of the vegetated cap will include assessment of surface water erosion damage, vegetative stress, tension cracks at the crest of slopes, and seepage along the side slopes. Semi-annual physical stability monitoring is recommended for the first three years after the vegetative cover has been planted. When the vegetative cover has become well established, annual monitoring is recommended.

Checking for tree health and addressing rodent activity by implementing beaver and vole controls will help to ensure that the vegetated areas have a low mortality rate and that vegetation density increases to the required level. The long-term monitoring will be less frequent than the short-term monitoring. Plant growth monitoring will be used to determine seasonal trends and if plant replacement is required.

To determine the percolation control success of the poplar tree plantation, TDR probes will be installed to monitor soil moisture at various depths. Four nests of four TDR probes will be installed at 0.3-m, 0.6-m, 1.0-m, and 1.3-m depths.

6.2 Chemical Stability and Water Quality

An extensive program is in place to monitor surface water and groundwater quality at the Deloro site. The program includes the monitoring of the seepage at the Tailings Area dams walls. Two monitoring networks on the Moira River and Young's Creek provide information on surface water quality and a series of monitoring wells on the site property assess groundwater levels and quality.

Future chemical stability and water quality monitoring efforts will be focused on the monitoring of surface water and groundwater at selected locations to evaluate the effectiveness of the recommended alternative following implementation.

The existing monitoring wells in the Tailings Area will need to be decommissioned prior to the construction of the vegetated cap. New groundwater monitoring wells will need to be installed at selected locations to undertake post-remediation groundwater monitoring. Monitoring wells will be installed in the Tailings Area upgradient of the dams walls because water quality at the toe of the dams walls will be monitored by measuring the water quality of the wells during pumping cycles.

Semi-annual monitoring of surface water quality at the selected locations is recommended initially for the first five years following completion of the Tailings Area rehabilitation activities. Provided that the results do not indicate any adverse impacts on surface water quality, the monitoring frequency would be reduced to annually following the initial five years.

The surface water sampling locations associated with the Tailings Area will be selected as part of a site-wide monitoring program to evaluate the improvement in water quality in the Moira River and Young's Creek. The post-remediation surface water sampling locations are anticipated to be similar to the existing monitoring networks on the Moira River and Young's Creek. This will allow comparison of post-remediation water quality data with (historical) data currently being collected by OCWA.

Testing of groundwater from the seepage and groundwater collection wells (i.e. sample collection, analysis, recording, plotting), recording of flow rates, groundwater level monitoring, and alarm testing will be required to track changes in each of these components over time and to predict their impact on the ATP.

6.3 Seepage and Groundwater Collection, Pumping, and Conveyance System

The monitoring of the seepage and groundwater pumping operations to ensure that the required pumping rate and the pipe integrity are maintained will be required. Monitoring will include pressure testing that may be as frequent as weekly if no alarms are in place and could be monthly if alarms are in place and tested regularly.

6.4 Biomonitoring

Biomonitoring will be undertaken in areas where natural environmental restoration measures are planned including the area affected by the construction of the interceptor ditch and the revegetation of the Tailings Area cap. The biomonitoring program will be undertaken during the first growing season following the construction of each remediated area, and annually thereafter for a total of five years. Biomonitoring will then be conducted once every five years over a twenty year period, and then every ten years over the long-term period.

Qualified field personnel will evaluate the success of herbaceous vegetation (i.e. grasses, wildflowers etc.) seeding and woody plantings. Annual monitoring for five years is required to allow the establishment of the poplar trees and to ensure they are functioning to minimize infiltration. Soil moisture and plant health/condition will be monitored and any hybrid poplar trees that are determined to be inadequate or dead will be replaced. Native colonizing species of shrubs and trees that germinate and grow in these areas will also be documented.

To further support the goals and objectives of the Tailings Area Closure Plan, the monitoring program may include the collection of plants (leaves and/or stems) from the capped and covered areas during the growing season and prior to senescence. The concentration of arsenic and metals of concern in the plant tissues could be chemically determined. Trends could be identified and comparisons to benchmark, toxicological and site data could be conducted to ensure that the closure objectives of the Tailings Area are being met.

Wildlife use, including direct sightings or signs such as tracks, burrows, dens, nests, and scat in the Tailings Area should be documented and recorded on a site map, as one of the site-wide closure objectives is to increase the quantity and quality of wildlife habitat and wildlife diversity. Wildlife observations could be documented by qualified field personnel while undertaking the other investigations and thus, would be completed with the same frequency and over the same period of time.

6.5 Site Management

It is anticipated that the following site management actions will be implemented or maintained:

- Fencing exists on the perimeter of the Deloro Mine Site and access will be restricted to authorized personnel.
- Signage exists on the perimeter fence as well as at the north and south approaches along the Moira River.
- The MOE will retain ownership and control of the site for the foreseeable future.
- Site conditions will be registered on title at the conclusion of the cleanup coincident with the issuance of a Record of Site Condition (RSC).

7. Malfunctions, Accidents, and Mitigation Measures

During the implementation and operation of the rehabilitative measures at the site, there is a potential that malfunctions (i.e. in design, construction, or commissioning) or accidents (e.g. due to acts of nature) could occur. These malfunctions and accidents can adversely affect remediation activities, and OMM of the site, resulting in delays or costly mitigation measures. These events must be considered and mitigation measures must be developed to ensure environmental impacts are minimal and acceptable.

Table 7.1 identifies mitigation measures for potential malfunctions and accidents that have a reasonable probability of occurring at the site during three time frames:

- Short-term: Preparation activities
- Mid-term: Remediation activities
- Long-term: OMM activities

TABLE 7.1
MALFUNCTIONS, ACCIDENTS AND MITIGATION MEASURES IN THE TAILINGS AREA

Malfunction (M) or Accident (A)	Mitigation Measures
Short-term: Preparation Activities	
M/A – Perpetual disruptive forces (MNDM, 1995)	The recommended alternative for the rehabilitation of the Tailings Area incorporates measures to mitigate perpetual disruptive forces.
A – Spill of contaminated soil, ATP related chemicals, fuel for construction equipment/vehicles	Construction contractors and other site personnel should be trained to respond to spills. Spill would be isolated and transferred to waste consolidation area or to an acceptable waste receiver if spill occurs offsite.
Mid-term: Remediation Activities	
M/A – Perpetual disruptive forces (MNDM, 1995)	The recommended alternative for the rehabilitation of the Tailings Area incorporates measures to mitigate perpetual disruptive forces.
A – Spill of contaminated soil, ATP related chemicals, fuel for construction equipment/vehicles	Construction contractors and other site personnel should be trained to respond to spills. Spill would be isolated and transferred to waste consolidation area or to an acceptable waste receiver if spill occurs offsite.
M/A – During cap/cover placement soils and vegetation could wash away	Straw blown onto sloped areas that are freshly planted, planting with annual rye or wheat will help stabilize the soil. If soils are washed away, then replace the soil and replant.
Long-term: Operation, Maintenance, and Monitoring Activities	
M/A – Perpetual disruptive forces (MNDM, 1995)	The conceptual design of the engineered soil cover, including the interceptor ditch, incorporates measures to mitigate perpetual disruptive forces. Further refinements will be addressed during detailed design.
A – After planting, soils and vegetation could be washed away	Replace soils and replant.

TABLE 7.1
MALFUNCTIONS, ACCIDENTS AND MITIGATION MEASURES IN THE TAILINGS AREA

Malfunction (M) or Accident (A)	Mitigation Measures
M – Diversion ditch fills with sediment and debris or requires repairs	Periodic monitoring program will identify need for cleaning or repairing diversion/drainage ditches. The site OMM manual will provide Diversion/ Drainage Ditches Cleaning and Repair procedures and protocols.
M – Poplar tree mortality due to soil conditions, contaminants, rodents, etc.	Install raptor perches to encourage hawks and owls to prey on rodents. Monitor routinely the health of the trees. Mulch trees, keep grass mowed to reduce potential for rodent damage. If mortality occurs, determine cause of mortality (soil conditions, contaminants, rodents) and rectify then replace trees.
M – Seepage and groundwater transfer pump failure	Use standby pump, routine monitoring of pump performance.
M – Seepage and groundwater transfer pump capacity insufficient	Purchase appropriate pump and replace original pump.
M – Piping failure	Install auto shutoff that is triggered if back pressure is too low – routinely monitor the pipe integrity.
M – Piping frozen	Shut down pump and thaw line – check heat tracing integrity – routinely monitor that the collected water is flowing.
M – Irrigation system not functioning	Troubleshoot and repair and restart or, if problem cannot be easily remedied, use a watering truck.
M – Electrical short-circuiting in pump control panel	Troubleshoot and repair. If due to rain/moisture, ensure waterproof features are in place.
M – Cover failure due to flooding	Since the majority of the cover is about 5 m above the floodplain of the 100-year flood, severe flooding that could potentially compromise the integrity of the cover and lead to the release of some of the contained tailings is considered remote.
A – Seismic occurrences	Design long-term structures at the Deloro site to the appropriate Seismic Zone . The probability of an earthquake of sufficient magnitude to breach the cover of the Tailings Area is very small given the stability of the region (Zone 1, low risk of earthquake). Any damaged areas during such an event would be identified and rectified using defined maintenance procedures.

Notes: Perpetual disruptive forces are defined in MNDM (1995) to include wind erosion; water erosion due to flooding, sheeting, rilling, and gulleying; sedimentation and debris accumulation; annual ice accumulation; seasonal frost penetration; soil restructuring; and physical and chemical weathering. Biological activities include root penetration, burrowing, intrusion, and actions by animals and man.

8. Expected Post-Closure Conditions and Uses

This section provides an assessment and description of the expected conditions and uses following closure activities.

8.1 Land Use

The final intended use of the site will be specified as a component of the federal EA. It is anticipated that access to the site will continue to be restricted and the fence that currently surrounds the site will be maintained for the foreseeable future.

8.2 Topography

In general, the topography in the Tailings Area will be heavily dependent on:

- The final grade of the land, suitable for stormwater runoff yet minimizing stormwater erosion
- The thickness of the engineered cover applied to the area

It is anticipated that the engineered cover will rise to a maximum elevation of about 197.25 masl at the west end of the Tailings Area, approximately 1.75 m higher than the current maximum grade in this area. The minimum elevation is expected to be about 193.75 masl, which is approximately 3.5 m higher than the minimum grade in the area. The added fill material is required to prevent ponding on the Tailings Area surface.

Public visual impacts associated with the Tailings Area are anticipated to be minimal, as the top elevation of the area (197.25 masl) will be 5.75 m to 9.25 m lower than the ground elevation in the Village of Deloro. Tree cover between the Village and the Tailings Area as well as the tree cover on the Tailings Area will reduce visual impacts to Deloro residents.

8.3 Water Resources

It is anticipated that the implementation of the recommended rehabilitation alternative for the Tailings Area will result in a marked improvement in water quality in the Moira River and Young's Creek.

8.4 Plant and Animal Life

As noted in Section 2.1.2, the post-closure risks to ecological receptors from the draft SLERA are not conclusive given information that is currently available. Additional site information is being collected and further risk evaluation is underway.

9. Approval Requirements

The primary site-wide regulatory approvals that must be applied for and issued by the appropriate government agencies are outlined in this section of the Closure Plan.

9.1 Site-Specific Risk Assessment

SSRA is the remedial approach selected from the options available in the Guideline for Use at Contaminated Sites in Ontario (1997). There are a number of steps to approval of an SSRA to ensure that public health and the environment are protected. First, an SSRA is reviewed by an independent third party peer reviewer who is qualified and experienced in conducting SSRAs. Once the peer reviewer's comments have been incorporated, the SSRA is submitted to the Standards Development Branch (SDB) of the MOE, which undertakes a review of both technical and policy issues. Other prerequisites for acceptance of the SSRA include community-based public communication and dialogue with the municipality regarding the SSRA. Once these steps have been completed, the cleanup can proceed.

As confirmation that the actual cleanup is completed according to the SSRA, a Record of Site Condition (RSC) will be prepared and filed to document the cleanup. The RSC is completed jointly by the proponent, MOE, as well as the consultant overseeing the cleanup. The SSRA is a Level 2 Risk Management involving the use of engineered controls (i.e. engineered covers, groundwater pumping/treatment systems). A Level 2 Risk Management requires Registration on Title for the property to document the conditions of the land in the public domain. Registration on Title will be accomplished through filing a Certificate of Prohibition.

As a result of the different land ownership between the Deloro Mine Site and the Young's Creek Area south of Highway 7, a separate SSRA report has been prepared for each of these two land parcels (see Section 2.1) following the process described in this section.

The current process for completing SSRAs, outlined above, was developed in 1997 and has been in place since that time. New legislation has been passed that is anticipated to modify this process once the enabling regulations are finalized. The new legislation, the *Brownfield Law Statutes Amendment Act*, received Royal Assent on November 21, 2001 and the public comment period for the regulations ended on April 29, 2003. Final regulations, which are expected to be released through 2003, may change the SSRA process from a guideline-driven to a regulatory-driven process. The draft regulations do not suggest significant change in the technical approach to SSRAs, but they do indicate some changes in the administrative aspects. The Deloro Mine Site SSRA will be adapted, if needed, to meet the new regulatory requirements.

9.2 MOE Authorizations

Under the *Environmental Protection Act* (EPA) and the *Ontario Water Resources Act* (OWRA), approval is required from the MOE for processes that emit to the environment or for waste management activities. The primary means of approval is through issuance of a Certificate

of Approval (C of A) for air or water emissions or a Provisional Certificate of Approval (PC of A) for waste related activities. A Permit to Take Water (PTTW) is required for water extraction above 50,000 L/day. Generator Registration is required for ongoing waste generation, such as the ferric arsenate sludge, which is generated by the onsite ATP.

A number of MOE authorizations already exist at the Deloro Mine Site as a result of environmental mitigation actions implemented to date. This includes extraction and pumping of impacted groundwater, treatment of water in the ATP, discharge of the treated effluent and storage/dewatering of sludge from the treatment process. A listing of the MOE authorizations currently in place at the Deloro Mine Site is provided in Table 9.1.

The Closure Plans will result in changes to the currently authorized systems, plus the addition of new systems. Changes to the current systems will require modifications to the existing MOE authorizations, most likely through an amendment (i.e. C of A Amendment). New systems will require new authorizations to be developed.

Certificate of Approval – Sewage

Amendment to the existing C of A for the ATP, sludge storage lagoon, pumping stations, and forcemains may be required to accommodate modifications to these systems as a result of the Closure Plans.

Certificate of Approval – Air

There is no anticipated requirement for modification of the existing C of As or to obtain new C of As as a result of the Closure Plans.

Permit to Take Water

The existing PTTW for the Tuttle Shaft pumping station will require amendment to account for installation of a permanent forcemain and the increase in pumping to year-round operation. Other PTTWs for the other pumping stations may also require some modifications.

In the Industrial Area, a new PTTW will be required to authorize the construction and operation of a groundwater interceptor system at the western property line. Similarly, a new PTTW will be needed in the Tailings Area for groundwater pumping from wells located in the vicinity of the tailings dams walls.

Provisional Certificate of Approval – Waste Disposal

The site cleanup is following the SSRA process (outlined above) where existing residuals and by-products will be managed onsite through a Level 2 Risk Management involving isolation and containment. Although the legacy materials being managed have been in place for several decades and are not the result of ongoing waste production and many of the materials are the result of mining activities (i.e. mill tailings from a mine) that are exempt from Ontario's Waste Management Regulation, the MOE has committed to seeking a PC of A for the proposed waste management facilities under Part V of the EPA. The development of Closure Plans for the Deloro site has drawn on landfill design standards, as well as mine closure and other guidelines, as general guidance and best management practices to ensure that the site is engineered and maintained to be safe and secure for hundreds of years.

TABLE 9.1
EXISTING MOE AUTHORIZATIONS FOR THE DELORO MINE SITE

Authorization	Type	Number	Date	Description
Certificate of Approval	Sewage	4-036-82-006	28 Jul 1982	Collection/storage/ treatment system
Certificate of Approval	Air	8-4042-82-006	8 Sep 1982	Lime silo venting and fume hood exhaust
Certificate of Approval	Sewage	4-053-83-006	18 Jul 1983	Pumping station and forcemain
Provisional Certificate of Approval	Waste Disposal Site	A362106	6 Sep 1983	Temporary storage processed sludge
Permit	Permit to Take Water	85-P-4006	26 Apr 1985	Tuttle shaft and pumping station #5
Certificate of Approval	Sewage	4-041-85-006	25 Jul 1985	Sludge drying lagoon
Permit	Permit to Take Water	85-P-4038	16 Aug 1985	Moira River
Certificate of Approval	Sewage	4-067-85-006	16 Sep 1985	Manhole rehabilitation
Certificate of Approval	Air	8-4069-86-006	17 Nov 1986	Plant exhaust system
Certificate of Approval	Sewage	4-116-86-876	8 Jul 1987	Tuttle shaft pump and forcemain
Certificate of Approval	Sewage	4-0155-87-006	20 Nov 1987	Sludge testing lagoon
Certificate of Approval	Air	8-4120-88-006	12 Dec 1988	Lab equipment exhaust
Generator Registration	Waste Streams	ONO199886	23 Jan 1989	Arsenic compounds and oils
Certificate of Approval	Air	8-4128-89-006	4 Dec 1989	Lab fume hood exhaust
Permit Amendment	Permit to Take Water	83-P-4010	6 Jun 1990	Pumping station #3
Permit Amendment	Permit to Take Water	82-P-4035	6 Jun 1990	Pumping stations #1, #2, and #4
Certificate of Approval Amendment	Industrial Sewage	4-041-85-006	27 Nov 1992	Sludge storage lagoon expansion
Permit Amendment	Permit to Take Water	85-P-4006	21 Feb 1996	Tuttle shaft and pumping station #5
Certificate of Approval Amendment	Industrial Sewage Works	4-036-82-006	20 Apr 2000	Decontamination facilities
Generator Re-registration (HWIN)	Waste Streams	ONO199886	Jan 2002	Ferric arsenate sludge
Provisional Certificate of Approval	Waste Disposal Site	2668-5DHJEW	30 Aug 2002	Temporary storage contaminated soil
Provisional Certificate of Approval Amendment	Waste Disposal Site	2668-5DHJEW	12 Nov 2002	Contingency plan

The Deloro Mine Site Cleanup Project is being carried out under an exemption to the provincial *Environment Assessment Act* (EAA). Ontario Regulation 577/98 (O.Reg 577/98) exempts the Deloro Mine Site Cleanup Project from a mandatory hearing under Part V of the EPA (Sections 30 and 32).

9.3 Conservation Authority

Through the Fill, Construction and Alteration to Waterways Regulation, which is administered in support of Section 28 of the Conservation Authorities Act of Ontario, the Conservation Authority regulates and may prohibit work taking place within valley, river, stream and watercourse corridors as well as along lake waterfronts.

Fill regulations allow the Authority to prohibit or regulate the placing, excavation, grading or dumping of fill of any kind for projects such as pools, ponds, roads, and driveways. These regulations are applied when, in the opinion of the Authority, the control of flooding, pollution, or the conservation of land within its jurisdiction may be affected by the placing or dumping of fill.

Construction regulations allow the Conservation Authority to regulate construction in or on a wetland or floodplain, or in any area susceptible to flooding during a regional storm. In this regulation, construction refers to new buildings, additions to existing buildings, stormwater outfalls, culverts, and bridges.

The alteration to waterways regulations allow the Conservation Authority to prohibit or regulate the straightening, changing, diverting, or interfering with the existing channel of a river, creek, stream, or watercourse.

Based on the remedial works that are proposed along the west bank of the Moira River (reconstruction) as well as within Young's Creek (sediment and soil removal and wetland rehabilitation), it is anticipated that a permit "To Construct, Place Fill, or Alter a Waterway" will be required from the Moira River Conservation Authority (MRCA) c/o Quinte Conservation (QC).

9.4 Ministry of Natural Resources

Of note within the Deloro Mine Site property and in the Young's Creek Offsite Area is a Provincially Significant Wetland (PSW), the Deloro Wetland Complex. The Deloro Wetland Complex, including the area along Young's Creek south of Highway 7, was evaluated during the summer of 2000 using the 3rd Edition of the wetland evaluation manual (Snider's Ecological Services, 2000). The wetland received a total score of 688 and was evaluated as a Class 2 PSW.

The management of Ontario wetlands and lands adjacent to them is implemented through the *Wetlands Policy Statement*, which falls under the jurisdiction of the *Planning Act*. The MNR and the Minister of Municipal Affairs jointly issued the *Wetlands Policy Statement*. The policy requires that all planning jurisdictions protect PSWs such that development is not permitted in PSWs that are located within the Great Lakes – St. Lawrence Region. Development and alteration may be permitted on lands adjacent to PSWs only if it does not result in:

- Loss of wetland function

- Subsequent demand for future development that will negatively impact existing wetland functions
- Conflict with existing site-specific management practices
- Loss of wetland area

An Environmental Impact Study (EIS) would have to be prepared in order to permit development on these adjacent lands.

Consultation is required with the MNR, and possibly the Minister of Municipal Affairs, to determine whether any of the project components, such as construction of the Young's Creek Area onsite containment cell and dredging, constitutes wetland "development" and whether the project can be permitted. Also, the MNR would need to determine whether an EIS would need to be completed.

The MNR is also responsible for issuing Work Permits under the authority and provisions of several different Provincial Acts. If the project is allowed to proceed, the Provincial Acts that apply to this project would have to be determined in consultation with the MNR. The following Provincial Acts and their regulations are considered in the application for a Work Permit.

Forest Fire Prevention Act: The MNR administers this Act. A Work Permit is required to authorize any work on Crown land and to ensure that adequate forest fire precautions and equipment are in place.

Lakes and Rivers Improvement Act: The purpose of this Act is to manage the use of the lakes and rivers in Ontario and to regulate improvements to them. The Act provides for the preservation of public rights in or over water; protection of the interests of riparian owners; management of fish, wildlife, and other natural resources dependent on such waters; preservation of natural amenities; and suitability of the location and nature of improvements. The *Lakes and Rivers Improvement Act* gives the MNR the mandate to manage water-related activities, particularly in the areas outside the jurisdiction of Conservation Authorities.

Public Lands Act: This Act, which is administered by the MNR, authorizes the construction of roads on Crown lands, sets out Crown cost-sharing of company roads, limitations on liability and tenure for private forest roads and camp areas, and defines the applicability of the *Highway Traffic Act* on access roads.

As part of the application for a Work Permit, each project proponent must complete and apply for "Parts" of the permit. The determination of which Parts (i.e. A through F) are applicable to the project is conducted in consultation with the MNR. The Parts that must be taken into consideration when applying for a Work Permit are briefly described below:

- *Part A:* Fire Prevention and Suppression/Logging Activities
- *Part B:* Mineral Exploration Activities
- *Part C:* Building Construction
- *Part D:* Application to do Work on Shore Lands
- *Part E:* Roads, Trails, or Water Crossings
- *Part F:* Works Within a Waterbody

Based on the work proposed at the Deloro Mine Site, a Work Permit will be required from the MNR. Several Parts to the application will have to be completed possibly including, but

not limited to, Parts A, D, and F. It is anticipated that the MNR will include conditions pertaining to work in the PSW with those issued as part of the Work Permit.

9.5 Department of Fisheries and Oceans/ Canadian Coast Guard

9.5.1 Navigable Waters Protection Act (NWPA)

The purpose of the NWPA is to protect the public right to marine navigation and to ensure unobstructed passage of vessels in Canadian waters. Any construction, modification or repair of a work that will interfere with navigable waterways must be approved or concurrence provided by the DFO and is administered by the Canadian Coast Guard (CCG). The removal of obstructions to navigation and the provision and maintenance of lights and markers required for safe navigation is also covered under this Act. Although the section of the Moira River that passes through the site has limited use for boating, many parts of the Moira River are navigable and the CCG should be consulted on the final cleanup plan for the site.

9.5.2 Fisheries Act

The federal Minister of Fisheries and Oceans has the legislative responsibility for the administration and enforcement of the federal *Fisheries Act*. The *Fisheries Act* protects and conserves fish and fish habitats and has the power to deal with damage to fish habitat, destruction of fish, obstruction of fish passage, necessary flow requirements for fish, and the control of deleterious substances. Section 35(1) of the federal *Fisheries Act* states that “no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat” (HADD). Any proposed works and activities that are likely to alter or damage fish habitat must be reviewed and authorized by the DFO. The Conservation Authorities have agreements with DFO in the evaluation and processing of applications and therefore would also have to be consulted.

It is important to note that DFO has also developed a Policy for the Management of Fish Habitat that includes a No Net Loss guiding principle. This principle is applied to any proposed development that would result in a loss of productive fish habitat. The regulatory agency would review the measures to determine if they meet not only the No Net Loss of fish habitat, but also the DFO’s long-term policy objective of achieving an overall net gain of the productive capacity of fish habitats. Therefore, works requiring an authorization from the DFO typically includes a Fisheries Compensation Plan that describes the measures taken to realize an overall net gain in the productive capacity of fish habitats as a result of the project.

A section of the west bank of the Moira River in the Industrial Area will be reconstructed, and a significant amount of work is proposed within Young’s Creek including the excavation of contaminated sediment/soil and wetland rehabilitation. As this will affect fish habitat, a Fisheries Act authorization will be required and a Fisheries Compensation Plan may have to be prepared. In addition, application for a blasting permit may be required to address “destruction of fish by any other means” (under the *Fisheries Act*), since a portion of the onsite containment cell will be located in Young’s Creek.

9.6 Environmental Assessment and CNSC Licensing

The *Nuclear Safety and Control Act* (NSCA) mandates the CNSC to regulate all aspects of the nuclear industry in Canada, including the management and isolation of nuclear wastes. Paragraph 26 of the NSCA states that:

“Subject to the regulations, no person shall, except in accordance with a licence, ...possess...manage, store or dispose of a nuclear substance. . .”

It is with respect to this paragraph that the MOE seeks to obtain a licence to manage and store, at various locations on the Deloro Mine Site, the radioactive wastes present on the site. Conceptual waste isolation scenarios are presented in Section 3.4 of this and other Closure Plans for radioactive (and non-radioactive) materials.

CNSC’s authorization of the project would be provided through the issuance of a Waste Nuclear Substance Licence (WNSL) for the possession, management and storage of nuclear substances, pursuant to subsection 24(2) of the NSCA.

As previously noted, because nuclear waste management and storage is a physical activity listed in the “Inclusion List Regulation” of the CEAA, the proposed project is subject to the federal Environmental Assessment (EA) process. Therefore, the licensing and the federal EA processes are closely linked, as explained below.

The screening level EA process being followed for this project is outlined in Section 2.3. At the completion of the EA study, the proponent must summarize the process and the results of the EA into a report that is submitted to the RA for its review. Once the RA is satisfied that the EA has met the initial scope, the report is then submitted to the members of the CNSC for its approval. A hearing in which the proponent presents the project and where the public is invited to voice its concerns or support may be required.

Following the approval of the results of the EA by the CNSC, an application for a WNSL must be formally submitted by the proponent in accordance with the General Nuclear Safety and Control Regulations and Nuclear Substance and Radiation Devices Regulations of the NSCA. A WNSL is applicable, as opposed to a Class Ib Nuclear Facility Licence, because mainly chemical wastes are being managed with the presence of some radioactive materials.

As part of the application for a WNSL, safety analyses must be conducted to ensure radiation exposures to both workers and the public are acceptable during normal and abnormal conditions at the site.

Some applicable portions of the General Nuclear Safety and Control Regulations which must be addressed in the application are as follows:

- 3 (1) (e) the proposed measures to ensure compliance with the *Radiation Protection Regulations* and the *Nuclear Security Regulations*;
- (f) any proposed action level for the purpose of section 6 of the *Radiation Protection Regulations*;
- (g) the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information;
- (h) the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment

or prescribed information;

(i) a description and the results of any test, analysis or calculation performed to substantiate the information included in the application;

(j) the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste;

Some applicable sections of the Nuclear Substance and Radiation Devices Regulations are as follows:

3. (1) An application for a licence in respect of a nuclear substance or a radiation device, other than a licence to service a radiation device, shall contain the following information in addition to the information required by section 3 of the *General Nuclear Safety and Control Regulations*:

(a) the methods, procedures and equipment that will be used to carry on the activity to be licensed;

(b) the methods, procedures and equipment that will be used while carrying on the activity to be licensed, or during and following an accident, to

(i) monitor the release of any radioactive nuclear substance from the site of the activity to be licensed,

(ii) detect the presence of and record the radiation dose rate and quantity in becquerels of radioactive nuclear substances at the site of the activity to be licensed,

(iii) limit the spread of radioactive contamination within and from the site of the activity to be licensed, and

(iv) decontaminate any person, site or equipment contaminated as a result of the activity to be licensed;

(c) a description of the circumstances in which the decontamination referred to in subparagraph (b)(iv) will be carried out;

Following submission of the application and any clarifications and/or additional materials required by CNSC staff, a draft licence is then prepared by CNSC staff, discussed with the proponent and ultimately presented to the members of the CNSC for approval. A hearing in which the proponent presents its application and where the public is invited to voice its concerns or support may be required. Upon acceptance, a WNSL is issued and remedial work can begin under the conditions of the Licence.

9.7 Mining Act

The regulatory considerations relevant to the Deloro project were examined early in the project and have been refined as the project has progressed. The document entitled *Deloro Mine Rehabilitation Project - Development of Closure Criteria, Final Report* (CG&S, October 1998) summarized the application of the *Mining Act* to the Deloro project. Even though the Crown (i.e. the Provincial Government) is exempt from the requirements of the *Mining Act*, the Closure Plans have been developed to satisfy, in general, the requirements of the document entitled *Rehabilitation of Mines, Guidelines for Proponents* (MNDM, 1995). MNDM has agreed to review the Closure Plans relative to accepted standards for closure and rehabilitation of mines in Ontario, although a specific approval will not be issued.

10. References

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