ABSTRACT

The Dominion (Gurney) Mine Site is located in the Grass River Provincial Park in the mid-western portion of Manitoba, approximately 560 km northwest of Winnipeg, Manitoba. The site is accessible by air or ATV/snowmobile trail. A private railway provides access to a staging area approximately 5 km from the site. Between 1933 and 1939, The Dominion (Gurney) Mine extracted and processed 94,650 tonnes of ore until reserves were exhausted. The mine was closed in 1939 and little exploration has occurred at the site since that time. At the time of assessment, the Mine Site consisted of several remnant building structures, metal and wood debris, a waste rock pile, an acid generating tailings area and five mine openings.

The engineering team and construction contractor had to address and overcome several challenges largely driven by the location of the site. The challenges affecting the Dominion rehabilitation program included northern climatic conditions, limited access, its location in a Provincial Park, First Nation concerns and requirements for their involvement in the rehabilitation, the necessity of addressing local concerns and providing local economic benefits.

This paper presents a summary of the site investigation, hazard classification, design of the remedial measures, construction challenges and design modifications to address changing conditions. Rehabilitation included construction of an access road, consolidation of wood and metal debris, concrete rubble, tailings and waste rock under a composite soil and geomembrane cover and sealing of the mine openings.
INTRODUCTION

In 2005, AMEC Environmental & Infrastructure (AMEC) was retained by Mines Branch of Manitoba Innovation, Energy and Mines (Mines Branch) to undertake a condition assessment of known inactive mine sites in Manitoba owned by the Crown, and to complete a hazard evaluation of those sites with regard to public safety and the potential for the site condition to impact the environment.

Data obtained through both a historical document review and on-site investigations of 148 inactive sites were compiled.

Following the completion of the desktop and field components of the program, AMEC developed a hazard matrix to aid in developing a Priority classification system. The matrix assigned a point value to various categories related to the potential for human and environmental health impacts.

Based on the hazard matrix, the former Dominion (Gurney) Mine Site was classified as a high hazard site and was prioritized for rehabilitation as part of the Orphaned and Abandoned Mine Sites (OAMS) Project undertaken by Mines Branch.

This paper presents a summary of the site investigation, hazard classification, design of the remedial measures, construction challenges and design modifications to address changing conditions.

PROJECT BACKGROUND

At the time of the field investigation, the former mine site consisted of several remnants of building structures, various metal and wood debris, a waste rock pile, and a tailings area deposited in a low-lying area. In addition there were five (5) mine openings, which ranged from being partially covered with wooden planks and fenced with barb wire, to completely open and obscured by vegetation.

The waste rock pile covered an area of approximately 5100 m² and had a volume of 18 600 m³. Two distinct sub-piles of waste rock were present; containing a finer rock portion to approximately 3 m above ground surface and coarser rock extending approximately 8 m above ground surface. The tailings extended over an area of approximately 3.28 ha. The depth of the tailings varied across the tailings area, ranging from 0.6 to 2.5 m thick. The tailings were stratified into a light brown to rust coloured oxidized surface layer overlying grey coloured unoxidized tailings.

It was originally estimated that 950 m³ of concrete foundations were present. In addition, approximately 20 m³ of steel and wooden debris were located on the Mine Site.
AMEC conducted several investigations and assessments in preparation of selecting an optimum rehabilitation/mitigation methodology, including:

- An initial environmental screening and geochemical assessment to determine the characteristics and potential environmental effects of the waste rock and tailings. The results of the assessment indicated that both the waste rock and tailings were potentially acid generating and contained elevated metal concentrations.
- An environmental assessment to assess the local soil, groundwater, surface water (wetland adjacent to the site), and vegetation conditions. The results of the assessment indicated that the local surficial soil and water had been impacted by inferred run-off water from the tailings area. The impacts appeared to be localized to the areas immediately adjacent to and north (down-slope) of the tailings area. Impacts to vegetation were also limited to this localised area.
- A Human Health and Ecological Risk Assessment to characterize the risks of the facilities and wastes at the site. The results of the risk assessment determined that there were no feasible risks to human health based on the isolation of the site and the lack of accessibility (surrounded by wetlands and dense boreal forest). However there was a potential risk to ecological receptors, primarily through the direct contact of waste rock and tailings to vegetation, soil invertebrates and burrowing mammals.

PROJECT DESIGN

Rehabilitation/Mitigation Technology Option Assessment

The objectives of the rehabilitation/mitigation program were to protect human health and safety, reduce or prevent ongoing environmental impacts, and rehabilitate the land to allow for a productive end use as wildlife habitat. Specific issues related to the site included the potential acidic drainage and/or heavy metals originating from the waste rock and tailings which could more significantly impact the local environment and physical safety risks to ecological receptors due to open or partially open shafts, deteriorating foundations, and debris at the site. As such, the mitigative actions required were to remove/mitigate the source or exposure pathway(s) of the contaminants, prevent access to any unsafe openings, and remove exposure to foundations and debris.

AMEC compiled several proposed methodology and technology options to achieve the goals of the rehabilitation/mitigation program. The methodologies and technologies were assessed and evaluated based on criteria determined as most relevant to the project’s successful implementation for all
stakeholders, for both short-term and long-term conditions. Criteria used for evaluating and comparing the options included four main categories: Effectiveness, Implementation, Acceptability, and Economics. The criterion in each category was given a point rating. Additionally, the categories were given a weighting factor based on expected level of importance for the owner (i.e., the Province). In its final form, the weighting factors were obtained from the owner, to ensure realistic expectations for the project were set. By assessing the characteristics of each option, each category was ranked accordingly based upon a consistent (though empirical) scale. The option(s) that met all criteria and ranked the highest in terms of weighted average score, became the preferred closure option.

Two main project constraints were prevalent in the evaluation of the methodology and technology options; the fact that the site was isolated within an ecologically sensitive Provincial Park and Mine Branch’s preference for a “walk away” solution with minimal required follow-up monitoring or maintenance.

Selected Rehabilitation/Mitigation Option and Design

Following evaluation of the reclamation options, AMEC recommended a preferred option which was agreed upon by Mines Branch. The preferred option involved the transporting of unearthed concrete foundations, gathered metal debris, and the waste rock for consolidation upon the tailings area. The consolidated wastes would then be sealed by an engineered cover and the cover would be vegetated. Additionally, all mine openings would be sealed with engineered polyurethane foam caps.

Aspects of the selected option are presented in more detail in the following sections.

Access

As previously stated, the site is located in a Provincial Park and is situated in an area of wetlands and dense vegetation. Following conversations and negotiations with Manitoba Parks and Natural Areas Branch, AMEC selected rail transport to Optic Lake Siding. AMEC negotiated rates for transportation to Optic Lake Siding with Keewatin Rail Company (KRC) for the project. The Keewatin Railway from Cranberry Portage traverses along the edge of the Grass River Provincial Park, within 6 kms of the site. KRC also operated a hi-rail truck to transport the personnel to and from Provincial Trunk Highway #10 and Optic Lake Siding. Following unloading at Optic Lake Siding, equipment and materials were transported via truck employing a combination of the abandoned/decommissioned Tolko Railway (consisting of rail bed without rails and intersecting the Keewatin Railway at Optic Lake Siding), a winter road (known as the “Peterson Winter Road”), and the path of the former railway to the site from the 1930s. The selection of this particular access minimized the need to disrupt and remove existing vegetation or further alter natural lands.

AMEC transportation engineers provided a temporary access road design to construct on the portions of the winter road and former site rail way in order to allow heavy equipment transport on the saturated wetlands. The design employed the use of a woven geotextile separator overlain by a biaxial geogrid, followed by the placement of crushed rock quarried from adjacent the former Tolko rail line. The design
included “turnarounds” at every kilometre to facilitate traffic travel in both directions and a contingent
design for culvert installations in excessively wet areas.

In summer 2013, the first kilometre of the constructed road from the former Tolko rail will be removed.
The road reclamation was scheduled to be completed immediately following the rehabilitation works but
ey early freezing temperatures delayed this task to after the spring thaw.

Sealing of Mine Openings

Traditionally the sealing of mine openings has relied upon engineered concrete caps. Due to project
constraints, and the high cost of shipping materials required for concrete capping to the site, this was not a
feasible option. AMEC devised a seal and cap strategy which employed the use of polyurethane
Equipment-less Foam Sealant (EFS) in place of concrete. Several advantages were recognized in the use
of the EFS at the Dominion (Gurney) Mine Site, first and foremost was the transportation of the materials
to the site. The EFS has expansive properties equal to approximately 25 times its placement volume,
resulting in the need for only approximately 1/25th of the required volume to be transported to the site.
Additionally, the EFS is stored and transported in drums which can be more effectively transported than
loose screened aggregate. Water is not required for EFS installation, negating the need to locate and
transport suitable water to the site from a nearby source.

Site preparation around the shafts/openings to provide working and staging areas and a clear view of rock
conditions at and below the collar were initially conducted, followed by the infilling of the openings to
the EFS pre-determined depths (based on the widest dimension) with waste rock. A vent pipe was
installed prior to EFS placement to minimize potential hydraulic (uplift) pressures on the cap. As a fire
barrier, the EFS was covered with a 100 mm thick layer of low strength concrete mixed with random
medium-sized waste rock found at the site.

Consolidation and Covering of Mine Wastes

AMEC employed a consolidated waste encapsulation concept at the site to prevent future ecological
exposure to the mine wastes and to prevent oxygen induction from creating potential acid generation in
the waste rock and tailings. AMEC positioned the encapsulated consolidated waste area (CWA) directly
on top of the mine tailings in order to minimize the disturbance of the tailings, eliminate the need to clear
forest for a burial site and reduce the timeframe of the project implementation by negating the need to
excavate and transport the tailings to a different location. Additionally, the tailings provided a much more
stable base than the surrounding soft wetland soils. AMEC conducted several design calculations to
determine the spatial and volumetric extent of the combined concrete foundations, metal debris, and waste
rock to be placed in the CWA, which resulted in the determination of the CWA footprint. The footprint
of the area was surveyed and staked at the site. The positioning of the CWA also required an engineered
analysis of the tailings which were outside the CWA footprint.

The additional concepts in the CWA design are discussed in the following sections.
Removal and Placement of Concrete Foundations and Metal Debris

Concrete structures, foundations, and supports were unearthed and demolished to pieces having one dimension of a maximum of 0.3 m. Exposed rebar was separated from the concrete and unbent or flattened to straight pieces. All pieces and rebar were transported to the CWA and evenly spread with the smallest dimension of each piece vertical, maintaining a buffer distance of 1.5 m from the CWA extents. It was calculated that there was approximately 900 m$^3$ of concrete actually present at the site, slightly less than originally estimated.

All metal containers and debris were compressed flat prior to placement in the CWA. The metal items were placed between the larger concrete pieces, therefore not relying on the metal debris to withstand the vertical force of the overlying waste rock mass.

Removal and Placement of Waste Rock

The coarser waste rock from the southern sub-pile was initially transported and spread evenly on the CWA, maintaining a 0.5 m buffer distance from the CWA extents and side slopes of 4H:1V. Once the coarser waste rock was placed, the finer waste rock from the other sub-pile was transported and spread over the top of the coarser rock, again maintaining side slopes of spread waste rock at 4H:1V and a 1% slope from centre on top of waste rock spread. All waste rock was placed in lifts and compacted prior to the successive lift.

Reuse of Tailings as a Bedding Material

Figure 1-Consolidated Waste Area

To minimize the potential of stress and tearing of the main liner for the CWA cover (as discussed in next section) from the angular waste rock, a bedding or buffer zone was designed to be placed between the top of the waste rock pieces and the liner. A fine sand has traditionally been used as the bedding material. As locating and transporting fine sand material to the site for this use would result in comparatively greater cost and time requirements, AMEC instead developed an innovative strategy to use tailings as the bedding material. The use of tailings for this purpose was acceptable as the bedding material remains encapsulated below the liner and it allowed for a condensed footprint smaller than the original tailings area for the final CWA extent. In calculating the optimal size and extent of the CWA, AMEC took into
consideration the calculation of the tailings balanced volume outside the CWA footprint to be employed for this purpose.

As previously stated, there are potential hazards with exposing unoxidized tailings. To mitigate potential releases of the unoxidized tailings to the surrounding environment and risks to site workers, AMEC developed a construction safety plan specific to the task of excavating the tailings outside the CWA footprint. A silt fence was constructed along the northern extent of the tailings area with the intent of capturing and containing tailings laden surface run-off during potential periods of high precipitation. Excavation was not conducted during periods of high winds and site personnel were to remain upwind of equipment during excavating. In order to minimize the amount of tailings exposed at one time, the excavation, transportation, and placement of the tailings was to progress only to the dimensions of each liner panel, plus 2 m in each exposed direction, until each panel was successfully installed.

Following the excavation of the tailings, a drainage swale and a liner anchor trench were constructed along the perimeter of the CWA. Following the liner installation, and keying the liner in and the backfilling of the anchor trench, the swale was infilled with coarse crushed rock (from the same material used to construct the roads) to form a permeable drainage system to direct surface water away from the cover. Excess natural soil excavated as part of the swale was employed to level and fill in low areas from the tailings excavation or in the former waste rock pile area.

**Installation of Consolidated Waste Cover**

![Figure 2-Cover Design](image)

Prior to the excavation of the tailings outside the CWA, a high strength polypropylene geotextile was installed over the waste rock. The high strength geotextile acts as a barrier to prevent the infiltration and loss of the bedding material into the voids within the waste rock spread. Following the geotextile installation, the tailings excavation and placement proceeded as per the description in the previous section, creating an equal bedding thickness of 0.3 m and maintaining the 4H:1V side slopes and 1% top slope.
A 23 100 m² bituminous geomembrane liner was installed over the tailings bedding material and extended into the anchor trenches. The selected liner consisted of a modified Styrene Butadiene Styrene (SBS) elastomeric polymer together with a high quality bituminous asphalt coating. This combination dramatically increases resistance to puncturing and effects of the elements, as well as being air- and waterproof. The airproofing and the resistance to puncturing characteristics were necessities to this project in order to prevent acid generation by the introduction of oxygen to the encapsulated waste rock and tailings and the puncturing from root systems as the native surrounding shrubs and trees eventually encroach onto the cover. The individual panels of the liner were placed and heat welded to previous panels as the liner installation progressed.

A geosynthetic drainage system was installed over the liner on the outside 4H:1V side slopes, emptying into the centre of the drainage swales. The drainage system was to redirect water off the top of the cover below the overlying organic soil layer (as discussed in the next paragraph) to prevent erosion on the side slope soil cover. Again, drainage systems of this nature are usually constructed from a layer of permeable sand and/or gravel material, which would have to been located and transported from an off-site source to the site resulting in increased costs and time frames. AMEC had previous experience in using the geosynthetic drainage system in providing drainage of landfills berms and pulp and paper waste piles, The system consists of perforated 25 mm diameter polypropylene pipes sewn in place at a defined and uniform spacing between two non-woven geotextiles. The geosynthetic drainage system’s main advantages are the decreased cost for this project due to the transport of the geosynthetic rolls in comparison to aggregate material, the geosynthetic is not an erodible material, and the geosynthetic drainage system allowed the cover to maintain a lower profile and thus a more natural appearance. Traditional drainage layers can add up to 0.5 m of thickness to the cover.

A 0.6 m thickness of consolidated peat and sand was placed on the liner and geosynthetic drainage material to create the organic top soil material. The organics were pre-mixed prior to transport to the site. Mechanical seeding of the cover with native vegetative species was conducted to establish vegetation. Following seeding, an erosion control blanket was installed on the cover to protect seeds and prevent erosion until vegetation is established. Additionally, broadcast seeding of the former waste rock pile location and removed tailings area outside the consolidated waste cover area was performed to initiate vegetation in these areas.

PROJECT IMPLEMENTATION

AMEC prepared and administered the tender for the project. Following the tender process, AMEC reviewed the tenders for compliance and price and recommended that Tervita Corporation (Tervita) be awarded the contract. Mines Branch accepted AMEC’s recommendation. Tervita initiated the project on 4 June 2012. Mobilization of equipment to the staging area at Optic Lake Siding and the temporary road construction began on 6 June 2012.
AMEC had originally sourced inert pre-crushed rock from Flin Flon as the road base material for the construction of the temporary access road. It was brought to AMEC’s attention shortly before the project was implemented that Manitoba Parks had recently quarried rock from within the park for the maintenance of winter roads. Tervita and AMEC successfully negotiated with Manitoba Parks to allow the crushing and processing of a rock outcrop adjacent to the intersection of the former Tolko railway and the Peterson Winter Road to provide the road base material for the entire access road and the CWA perimeter swale filling. While the cost to the project was not significantly altered due to honouring the unit rates bid by the contractor and rail transport bids by KRC, the use of the local source adjacent to the road saved considerable construction time which enabled the project to get ahead of schedule, allowing for additional time to address other impediments as they arose. The crushing operations were subcontracted to a local contractor, providing added economic benefit to the region. Access road construction continued until 26 July 2012 at which point the access road reached the site.

In addition to the road base material, Tervita and AMEC negotiated with Manitoba Parks to quarry sand from a local deposit at the periphery of the site area and peat from adjacent to the access road. The original design had sand and peat, which were to be combined for the organic top on the CWA cover, imported to the site from a source near The Pas, Manitoba. The use of sand in the construction was increased when the CWA was expanded (as explained in the following paragraph) for additional bedding material and to fill the areas of excavated tailings and waste rock. In employing the local sources for the sand and peat, it was estimated that approximately $114K cost savings were recognized from the project budget. The original supply of the off-site peat and sand was initially arranged with the local subcontractor who conducted the rock quarrying.

When initial excavations of the waste rock pile were conducted to aid in a preliminary survey of the rock quantities, it was determined that the base of the waste rock had penetrated into the soft wetland soils and there was waste rock in a slight bowl on the bedrock outcrop, resulting in an additional 5000 m³ volume of waste rock below ground surface, which was not accounted in AMEC’s design. Upon receiving this information, AMEC conducted further engineering analysis and altered the design of the CWA to incorporate a larger footprint for the integration of the additional waste rock. The new design also
required a shift in orientation as the increased size of the CWA conflicted with bedrock topography in the area. The consequence of the spatially larger CWA was that the volume of tailings outside the footprint was no longer sufficient to supply the required bedding material. As Tervita had already received permission to quarry the sand deposit adjacent to the site and the quantity of available sand had been established, AMEC compensated for the lack of tailings material with the local sand. Additionally, as volume of natural soil in the excavated area was also reduced, the native sand was employed as fill in the areas requiring leveling and to bring the former footprint of the waste rock pile back to grade. Additional peat was placed on the surface of these areas to facilitate the vegetative growth from seeding.

The remainder of the project was completed as per the design.

Schedule and Cost

The proposed schedule for the project at the time of tender included project initiation on 11 February 2012 (to take advantage of frozen ground for road construction), with substantial completion on 15 July 2012 and final completion on 15 August 2012. However, a scheduling variance was applied after the award of the contract was delayed for over 90 days and the onset of spring thaw at award which withdrew the advantage of constructing on frozen ground. It was determined that construction during the spring thaw would also hinder progress. AMEC and Tervita agreed to a new project initiation date of 4 June 2012 with substantial completion at 18 September 2012 and final completion in 29 September 2012. Tervita initiated the project on schedule. Due to the additional waste rock detected below ground surface and the redesign of the CWA, the date of substantial completion was delayed to 14 November 2012. Final completion was further delayed to Summer 2013 when the road removal and re-vegetation components, the final tasks in the project, were completed.

AMEC had originally estimated a cost range of $6.0M to $7.8M for the project prior to tender. Tervita’s successful bid based on the estimated unit volumes was approximately $6.2M. Due to the additional waste rock discovered in the subsurface, the supplementary materials required for the expanded CWA, and additional road base material required above the estimated volume due to localized areas of extremely soft grounds along the access road route, the additional costs for the project equaled approximately $1.06M. However, a cost savings of $200K was realized through the usage of the local sand and peat deposits and other items in which efficiencies were implemented. At the completion of the project, with the contingency for the road removal portion in Summer 2013, the total cost of the rehabilitation program implementation was approximately $7.1M. Included in the total cost, 33.4 percent of cost expenditures were to First Nation resources and an additional 3.9 percent of cost expenditures were to local business (subcontractors, lodgings, etc.)

Challenges

The location of the Dominion site presented several challenges to the design and construction teams. Access to the site was restricted to air, ATV or, during the winter, snowmobile. Being located within a Provincial Park necessitated consultation with and approvals from Manitoba Parks for all rehabilitation works in addition to the usual regulatory approvals from Manitoba Conservation and Water Stewardship
Since the site is also located within the traditional area of the Mathias Colomb First Nation, the contract documents were prepared with specific requirements for First Nation involvement. The scope of the project was anticipated to be beyond the capacity of local contractors. To enhance the economic benefit to the local economy, the contract documents contained specific requirements for the use of local subcontractors.

Of these challenges, the most difficult to overcome was the limited access. The only permanent infrastructure providing access near the site was a private railway owned by KRC which had an unloading area at the Optic Lake siding located approximately 6 km from the Dominion site. This limited access restricted the equipment to be used in the site investigation to hand tools which compromised the investigation of the depth and extent of tailings and waste rock, and the actual geometry and configuration of the mine openings. Access to the site for implementation of the rehabilitation works required the construction of approximately 6 km of road, suitable for heavy equipment along a former trail to the site in an extremely wet environment including three minor water crossings. All equipment and construction materials had to be loaded onto KRC rail cars at a highway crossing a few km north of Cranberry Portage for transportation to the Optic Lake siding where the equipment and material were off loaded for transportation to the site over the newly constructed road. Personnel and small equipment would be transported to and from the Optic Lake siding on a daily basis via smaller rail vehicles. In addition, the contractor was required to prepare a site specific health and safety plan which addressed the remote location and provided for emergency evacuation in the event of an injury.

First Nation Involvement

Throughout the course of construction, three first nation(s) corporations/companies were included to assist in all operations on site and to aid in the overall success of the project.

Pukatawagan Development Corporation [PDC] – Total Contract Cost = $160,000.00

For transportation to Optic Lake, PDC supplied a Hi-Rail Truck to transport the crew to site on a daily basis. PDC made sure the Hi-Rail operator was at the railway crossing at 6:00 AM every morning. For safety measures, the operator remained on site throughout the shift to transport injured workers back to the highway if they became hurt or injured during the shift.

The participation of PDC was a significant factor in the success of the project at Dominion (Gurney) Mine as they provided site access from June 5, 2012 to December 7, 2012.

Keewatin Railway Company [KRC] – Total Contract Cost = $113,000.00

Mobilization and Demobilization (Equipment and Supplies)
All equipment and supplies were transported by train and flat car from The Pas, Manitoba to Optic Lake, Manitoba by KRC. From June 8, 2012 to December 7, 2012, KRC transported (4) 30 Ton Rock Trucks, (1) 325 Excavator, (1) 350 Excavator, (1) D6 Dozer, (2) Pick-up Trucks, (50) rolls of Bituminous Liner, (30) rolls of Drain-Tube Liner, (125) rolls of 16-oz Geo-textile Liner, (151) rolls of
Geo-grid Liner, (54) rolls of High-Strength Geo-textile, (1) office trailer, (1) fuel tank and various other supplies and equipment.

KRC was also contracted to plant seedlings over the disturbed area of the site.

**Missinippi Construction – Total Contract Cost = $15,000.00**

Missinippi Construction provided a 35,000 liter fuel tank to supply fuel for all of the equipment on site. The tank was delivered prior to the mobilization of equipment and remained throughout the entire course of construction. Missinippi Construction also provided a laborer to assist with the pouring of concrete and foam within the open mine shafts and without this person, the project would not have moved as smoothly.

Missinippi Construction was asked to provide hourly rates for equipment on site and unfortunately Tervita and Missinippi Construction were not able to come to mutually acceptable commercial terms.

**Use of Local Contractors**

**Granular Material – Gravel Road Base Aggregate – KRC / Joey Werbicki Trucking Company**  
- *Total Contract Cost = $1,890,000.00*

To construct the 5.5 km access road to Dominion (Gurney) Mine, KRC and Joey Werbicki Trucking prepared and produced aggregate consisting of 150mm minus pit-run or crushed with less than 15% passing the 75m (No.200) sieve by blasting and crushing several portions of bedrock within the area of Optic Lake. To minimize Environmental impacts, all aggregate had to consist of non-acidic generating and non-metal leaching material. During the production of aggregate, samples were transported to National Testing Laboratories in Winnipeg for sieve analysis and the ALS Laboratory Group in Vancouver for metal leaching analysis to confirm that the gradation and material characteristics met all project specifications.

Material was blasted and crushed on site by a local contractor, Joey Werbicki Trucking. Equipment utilization included a (1) Small El-Russ Crushing Spread, (1) 980 Loader, (1) D6 Dozer and (1) 320 Excavator.
Total Granular Material Produced = 36,000 m³

**Organic Cover – Sand/Peat Mixture - Joey Werbicki Trucking Company**
- Total Contract Cost = $620,000.00

The final cover layer on the consolidated waste area included a Sand/Peat Organic mixture consisting of 50% sand and 50% peat. KRC, with the use of Joey Werbicki Trucking, produced 22,000 m³ meters of material on site with the use of (3) 30 Ton Rocks Trucks to transport sand and peat, (1) Screening Plant to remove all deleterious material, (1) D6 Dozer and (1) 980 Loader and (1) 320 Excavator.

Total Sand/Peat Mixture Produced = 22,000 m³

**Sand/Peat Mixture – KRC / Joey Werbicki Trucking Company**

The original plan for the imported sand/peat mixture on the consolidation area was to have sand and peat transported by truck from The Pas, Manitoba by Joey Werbicki Trucking and KRC, off loaded, mixed and placed on rail cars in Cranberry-Portage Manitoba, transported to Optic Lake, off loaded, mixed and placed in 30 Ton Rock Trucks for the 5.5km distance to site, and finally placed evenly by a D6 Dozer. To limit the triple and quadruple handling of material, maintain and increase the local and aboriginal involvement within the project, and to decrease the overall cost to the client, AMEC and Tervita decided to amend the strategy by creating a small borrow pit 500m from the consolidation area at Dominion (Gurney) Mine.

Within the borrow location, 11,000 m³ of sand was excavated, screened and stockpiled by Joey Werbicki Trucking and KRC to attain the appropriate gradation. Once the appropriate quantity of sand was prepared within the borrow location, organic material was excavated from both sides of the first kilometre of the access road leading to Dominion Mine, transported by 30 Ton Rock Trucks to the borrow location and mixed accordingly to produce the required 50/50 material mixture for the consolidation area.

**Regulatory Involvement**

The location of the project within a provincial park necessitated the participation and approval of Manitoba Parks in addition to Mines Branch (the client), MCWS and the Department of Fisheries and Oceans (DFO). During the initial project review and subsequent approvals as the scope of work was modified, the various regulators participated without overlap or contradiction.

**Manitoba Conservation/Manitoba Parks**

Initially, the scope of work required construction of approximately 1 km of new road along the railway right of way from the Optic Lake siding, where the equipment and material was to be unloaded, to a point where the former trail from the Dominion site, to be reconstructed as the main access route, intersected the KRC railway. To reduce new construction and impact within the park, Manitoba Parks requested that
an alternate route be considered, making use of a decommissioned rail bed and an existing winter road. In response to their request, the route was amended. The new route proceeded east from the Optic Lake siding for a distance of about 1 km along the decommissioned Tolko rail bed, and south for a distance of approximately 1 km along the winter road to intersect the planned access route. The amended route was approximately the same length as the original route.

When the tailings were found to extend beyond the limit interpreted from the initial field investigation, Mines Branch, Manitoba Parks and MCWS were presented with a number of options for addressing the situation ranging from leaving the tailings in place to complete removal. AMEC and the three regulators agreed that tailings located within the tree line would be left in place. The remaining tailings were located beneath an organic layer, with an oxidized dry layer of tailings overlying a saturated zone. For these tailings, it was decided to leave the saturated tailings in place, remove the dry tailings to the consolidated waste area and replace the excavated tailings with a sand/peat mixture graded to match the original contours.

When the mine openings were fully exposed using heavy equipment, it became apparent that the actual dimensions of the openings were greater than estimated during the site investigation and that concrete caps would not be a viable solution. Some of the mine openings were shallow pits with one or more raises intersecting the bottom of the pit. Since foam placement required drawing down the water within the openings, the potential requirement for water treatment became an issue. Water samples were taken at each opening and the analytical results submitted to Manitoba Parks for review. Fortunately the water quality and small volumes allowed discharge to a low area within the footprint of the excavated waste rock pile and water treatment was not required.

The original construction scope of work included placing trees removed during clearing and grubbing along the sides of the constructed access road. The stockpiled trees were to be placed across the road at the end of the project to restrict access to the site. Since the alignment is used by local residents for recreation access in the general area, Manitoba Parks received a number of complaints regarding the planned placement of the trees. Manitoba Parks requested that placement of the trees be removed from the scope of work and the construction contract was so amended.

Department of Fisheries and Oceans

Construction of the access road required three water crossings requiring the installation of culverts. Tervita submitted to the Department of Fisheries and Oceans analytical results from water samples obtained at each crossing, along with photographs and site plans showing the drainage of the affected areas. After review of the information, DFO determined that placing culverts as proposed would not require an authorization under The Fisheries Act.

CONCLUSIONS

The Dominion Minesite was successfully rehabilitated to contemporary engineering standards and to the satisfaction of the regulatory agencies and local community. The challenges of access, multiple
regulators, First Nation and local economic benefit and scope changes were overcome through diligent and conscientious consultation between all participants. The project provided $2,770,000.00 into the local economy via First Nation and local contractor participation. A significant portion of the success of the project resulted from the manner in which Tervita managed the construction. Their commitment to meaningful participation by First Nations and local contractors and their initiative in working together with AMEC to improve cost efficiencies and provide innovative solutions to changes in the design was exemplary.