APPENDIX E

CONCEPTUAL CLOSURE PLAN

RAINY RIVER RESOURCES LIMITED
RAINY RIVER PROJECT

CONCEPTUAL CLOSURE PLAN

Version 2

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FORWARD LOOKING INFORMATION

This document contains "forward-looking information" as defined in applicable securities laws (referred to herein as "forward-looking statements"). Forward looking statements include, but are not limited to, statements with respect to the cost and timing of the development of the Rainy River Project, including the exercise of the economic parameters of the project; the success and continuation of exploration activities; estimates of mineral resources; acquisitions of additional mineral properties; the future price of gold; government regulations and permitting timelines; estimates of reclamation obligations that may be assumed in connection with the exercise of the economic parameters of the project; requirements for additional capital; environmental risks; and general business and economic conditions. Often, but not always, forward-looking statements can be identified by the use of words such as "plans", "expects", "is expected", "budget", "scheduled", "estimates", "suggests", "continues", "forecasts", "projects", "predicts", "intends", "anticipates" or "believes", or variations of, or the negatives of, such words and phrases, or statements that certain actions, events or results "may", "could", "would", "should", "might" or "will" be taken, occur or be achieved. Inherent in forward-looking statements are risks, uncertainties and other factors beyond the Company's ability to predict or control. These risks, uncertainties and other factors include, but are not limited to, the assumptions underlying the document not being realized, future gold prices, changes in cost of labour, supplies, fuel and equipment, changes in equity markets, actual results of current exploration, changes in project parameters, exchange rate fluctuations, title risks, regulatory risks and uncertainties with respect to obtaining necessary surface rights and permits or delays in obtaining same, and other risks involved in the gold exploration and development industry, as well as those risk factors discussed in the section entitled "Description of Business-Risk Factors" in Rainy River Resources' 2012 Annual Information Form. Forward-looking statements are based on a number of assumptions which may prove to be incorrect, including, but not limited to, the availability of financing for the Company's exploration and development activities; the timelines for the Company's exploration and development activities on the Rainy River Property; the availability of certain consumables and services; assumptions made in mineral resource estimates, including geological interpretation grade, recovery rates, and operational costs; and general business and economic conditions. Forward looking statements involve known and unknown risks, uncertainties and other factors which may cause the Company's actual results, performance or achievements to be materially different from any of its future results, performance or achievements expressed or implied by forward-looking statements. All forward-looking statements herein are qualified by this cautionary statement. Accordingly, readers should not place undue reliance on forward-looking statements. The Company undertakes no obligation to update publicly or otherwise revise any forward-looking statements whether as a result of new information or future events or otherwise, except as may be required by law.

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PREAMBLE

The Conceptual Closure Plan document provided herein has been prepared to support the final Environmental Assessment Report for the proposed Rainy River Project in order to assist in the decision making process in regards to the requirements of the *Canadian Environmental Assessment Act, 2012*, and the Ontario *Environmental Assessment Act*. This document has been prepared to provide preliminary details of progressive reclamation and final closure activities, long term monitoring program and expected site conditions after closure.

This Conceptual Closure Plan is not intended to constitute an entire Closure Plan nor fulfil requirements of the Ontario *Mining Act*, although aspects of this document will be used to develop the certified closure plan. This document has been prepared in response to a request during consultation on the Proposed Terms of Reference consultation.

1.0 INTRODUCTION

1.1 Purpose of Document

Rainy River Resources (RRR) has been exploring the Rainy River Project (RRP) property since 2005, with the objective of developing a gold mine and process plant on the site. To progress the RRP, RRR has initiated a Federal and Provincial Environmental Assessment (EA) process. This Conceptual Closure Plan has been prepared in order to support the EA for the proposed RRP by providing preliminary details of proposed progressive reclamation and final closure activities, long term monitoring program, and expected site conditions after closure.

1.2 Legislative Framework

RRR is required to complete a Standard Environmental Assessment pursuant to the *Canadian Environmental Assessment Act, 2012*. In consultation with the local Provincial regulatory agencies, RRR has entered into a Voluntary Agreement with the Ontario Ministry of the Environment to conduct an Individual Environmental Assessment for the RRP in accordance with the requirements of the Ontario *Environmental Assessment Act*.

Prior to RRP construction, the Ministry of Northern Development and Mines (MNDM) will require submission of a comprehensive closure plan in accordance with Part VII of the *Mining Act* and Ontario Regulation 240/00, Mine Development and Closure under Part VII of the Act.

1.3 Closure Objectives and Environmental Design Criteria

The following objectives have been established for closure of the RRP:

a) Prevent, reduce or mitigate residual adverse environmental effects associated with each phase of the RRP, including closure and post-closure phases;

b) Provide for the reclamation of all affected sites and landscapes to a stable and safe condition;

c) Reduce the need for long term monitoring and maintenance by designing for closure and instituting progressive reclamation, as possible;

d) Provide for long term monitoring and maintenance of areas affected by the RRP where appropriate;

e) Provide for mine closure using current available proven technologies in a manner consistent with sustainable development; and

f) Meet applicable regulatory requirements, including the Mine Reclamation Code of Ontario (the Code) under Ontario Regulation 240/00 of the Ontario *Mining Act*.

The objective of closure from a natural environment perspective is to reclaim the mine site area to a naturalized and productive condition on completion of mining. The terms naturalized and productive are interpreted to mean a reclaimed site without infrastructure (unless otherwise negotiated), that while different from the existing environment, is capable of supporting plant, wildlife and fish communities; and other applicable land uses.

1.4 Organization and Content

This document has been prepared to support the EA process for the proposed RRP in order to assist in the decision making process in regards to the requirements of the *Canadian Environmental Assessment Act, 2012*, and the Ontario *Environmental Assessment Act*. It has been prepared to provide preliminary details of proposed progressive reclamation, ongoing and final closure activities, long term monitoring program, and expected site conditions after closure, to gather feedback from stakeholders and Aboriginal groups.

This Conceptual Closure Plan is not intended to constitute an entire Closure Plan nor fulfil requirements of the Ontario *Mining Act*. Aspects of this document will be used in the development of the certified closure plan. This document has been prepared at the request of Provincial agencies made during the Terms of Reference consultation.

2.0 PROJECT INFORMATION

2.1 Project Location

The RRP is located in the Township of Chapple, District of Rainy River, in northwestern Ontario (Figure 1). The Project site is located in a low density rural area within the Township of Chapple (total population of 856 in 2006). The RRP site and surrounding lands are dominantly privately held, with RRR holding a very large private land package. Thunder Bay is located approximately 420 km east-southeast of the site.

Additional local communities close to the Project site are: Emo (population 1,305; located 28 km to the southeast), Rainy River (population 909; located 45 km to the southwest) and Fort Frances (population 8,103; located 50 km to the east-southeast).

2.2 Project Summary

RRR proposes to construct, operate and eventually reclaim a new open pit and underground gold mine at the RRP property. The proposed site layout places the required mine related facilities in close proximity to the open pit, to the extent practical, and on lands to which RRR has access or reasonably expects to gain access. Figure 2 provides the proposed site plan showing the proposed RRP site and related infrastructure.

Open pit mining operations is anticipated to occur at a rate of approximately 21,000 tonnes per day (tpd), supported by a planned approximately 1,000 tpd underground mining operation. Stripped overburden and mine rock from the open pit will be stored in nearby stockpiles. Mining operations will be supported by development of an explosives manufacturing and storage facility.

Ore processing will be carried out using conventional whole ore cyanidation for gold recovery, followed by in-plant cyanide destruction using the SO_2/Air oxidation process. Process plant tailings will be stored in a constructed tailings management area (TMA) located northwest of the open pit. The process plant will operate on extensive waste water recycle derived from the TMA and mine water. Clarified excess TMA and mine water which cannot be reused will be discharged to the Pinewood River after a secondary polishing pond, either directly by pipeline or by means of the proposed constructed wetland through a local creek. Such discharge will, at the final point of discharge to the environment, meet all applicable Federal and Provincial effluent discharge requirements, and will be protective of receiving water aquatic life.

A maintenance garage, warehouse and administration complex will be constructed adjacent to the process plant. Non-hazardous domestic solid wastes for the construction and operation phases are proposed to be deposited in an existing offsite landfill facility operated by the Township of Chapple. An onsite demolition landfill will be created to support closure, most likely placed within the overburden stockpile or adjacent to the east mine rock stockpile. Hazardous solid and liquid waste will be hauled off site by licenced contractors to licenced storage facilities. Domestic sewage will be treated using a package sewage treatment plant or equivalent.

The construction workforce and staffing for permanent operations will be housed within local communities and environs. Although not expected, there is the potential for minor temporary accommodations to be developed within the RRP footprint by contractors which will meet all regulatory requirements.

As part of the proposed mine development, realignment of gravel-surfaced Highway 600 will be required. Initial construction power will be provided by the existing connection to the Provincial electrical grid, supported by diesel power generator(s) if required. Permanent power will be provided through dedicated connection to a nearby 230 kilovolt (kV) transmission line. In addition, it is expected that West Creek and Clark Creek (the lower part of which is the Teeple Municipal Drain) will require diversion to allow safe development and operation of the open pit and east mine rock stockpile, respectively.

2.3 Project Components

The proposed major surface features of the developed mine site area will include:

- Open pit: approximately 200 hectare (ha) surface area and up to approximately 400 m in depth. Mining is proposed to occur at a combined open pit and underground rate of approximately 22,000 tpd of ore production, with a mine life of approximately 16 years.

- Underground mine: up to approximately 1,000 tpd developed to a depth of about 800 m below surface.

- Mineral waste stockpile(s): approximately 70 to 80 million tonnes (Mt) of overburden and 350 to 400 Mt of mine rock not required for site construction purposes will be stored in surface stockpiles. An overburden stockpile, non-potentially acid generating (NPAG) mine rock stockpile (west mine rock stockpile); encapsulated potentially acid generating (PAG) mine rock stockpile (east mine rock stockpile); and temporary high and low grade stockpiles will be created.

- Primary crusher and process plant: ore will be processed onsite to produce doré bars for sale under long term contracts.

- TMA: an area has been selected that measures approximately 800 ha (excluding associated external ponds and infrastructure) and would provide capacity for the storage of a minimum 115 Mt of tailings over the projected mine life. The maximum projected dam heights are expected to be in the range of 20 to 25 m above grade.

- Transmission line: power for later construction and operations phases is proposed to be supplied by a 230 kV transmission line connected to the existing Hydro One Networks line approximately 17 km northeast of the proposed RRP site.

- Relocation of gravel-surfaced Highway 600: RRR proposes to realign a portion of Highway 600 to the south of the mine development.

- Associated buildings, facilities and infrastructure: additional permanent facilities currently planned for the RRP are expected to include an administration building, truck shop, fuel storage and dispensing, laydown area(s), sewage treatment plant, explosives manufacturing and storage facilities, demolition landfill, access road and onsite roads. These facilities will be supported by related piping and power infrastructure as needed.

In regards to the stockpiling of NPAG and PAG mine rock, a preliminary acid rock drainage (ARD) block model was developed for the Feasibility Study to determine the tonnages of PAG and NPAG rock that will be produced during mining of the RRP. During operations, confirmation of the PAG or NPAG character of the mine rock will be completed by sampling and testing of blasthole cuttings as required. A Leco furnace will be used to determine the total sulphur and inorganic carbon contents of the blasthole samples. This information can be used to reliably determine the PAG or NPAG character of the rock.

2.4 Existing Environment

The RRP site land is heavily impacted by historic and ongoing logging and to a lesser extent farming operations. The principal local features of existing and past land uses are those related to limited existing and past forestry and agricultural practices in the area. Areas of abandoned farmland are evident throughout the RRP site, where farmlands are returning to scrub and successional forest communities, including in some cases small, desegregated wetlands. There are some residual houses and buildings on the RRP site; some of which continue to be used temporarily by the previous landowners, and some of which RRR currently utilize to support the RRP. Where tree cover is present, it is predominantly mixed poplar forest. Poplar forests, principally Trembling Aspen, are indicative of disturbed lands recovering from past forestry and farming activities, or regrowth following past fires.

Access to the RRP site is available from existing Highway 600, a gravel-surfaced road that passes through the RRP site, which connects to Highway 71 (paved). Highway 71 provides connections to Emo and Fort Frances, and from Fort Frances to Thunder Bay by means of Highway 11. In the northward direction, Highway 71 connects with the TransCanada Highway 17 near Kenora. The closest existing railway access for the RRP is located at Emo (Canadian National Railway). The RRP site is currently serviced by a local power transmission line.

The RRP site area is positioned within the upper portion of the Pinewood River watershed. The Pinewood River drains to the Rainy River approximately 37 km downstream from the site. The

Rainy River itself is an international waterway, flowing through Ontario into the Arctic watershed. A number of small tributaries drain from the general RRP site area to the Pinewood River. These include generally from west to east: Loslo Creek (Cowser Drain), Marr Creek, West Creek and Clark Creek (Teeple Drain), all located on the north side of the Pinewood River. A number of the creeks and tributaries, including Clark Creek, have been altered to act dominantly as agricultural drains. There are no lakes present or near the RRP site.

There are no Areas of Natural and Scientific Interest, or Provincially Significant Wetlands close to the RRP site. There are two Provincial Nature Reserve Parks (Cranberry Lake and Spruce Islands) located over 20 km west and one Conservation Area (Sifton Township) located approximately 13 km northwest of the Project area.

The RRP site does not overlap with any First Nation reserve lands or lands under land claim and the RRP itself is located primarily on private lands. The Rainy Lake Reserve 17b located east of the proposed transmission line connection point is the closest reserve to the RRP, although upstream.

Figures 3a and 3b show the predevelopment conditions at the RRP site, with an overlay of the proposed RRP conceptual layout.

3.0 PROPOSED PROGRESSIVE RECLAMATION

Closure of the RRP site will be governed by the Ontario *Mining Act* and its associated Regulations and Codes. The *Act* requires that a Closure Plan be filed for any mining project before the project is undertaken, and that financial assurance be provided prior to substantive development to ensure that funds are in place to carry out the Closure Plan. The proposed progressive and final reclamation described herein is consistent with the Ontario *Mining Act* and its associated Regulations and Codes.

Work tasks that can be performed prior to actual site closure, and that do not pose an impediment to day to day operations of the site, are candidates for progressive reclamation. In general, progressive reclamation tasks involve reclamation of a portion(s) of the site with the aim of reducing the amount of work required at the time of site closure, with the potential to use the knowledge gained through progressive reclamation to improve final reclamation success.

The progressive reclamation measures proposed as part of this Conceptual Closure Plan are proven methods that are technically and economically feasible and reflect the Closure Plan objectives. Progressively reclaiming facilities as possible during the operations phase will help identify growing conditions and species to ensure sustainable landforms and revegetation growth at final closure.

Most of the RRP site will be actively utilized during the construction and operation phases, and thus, progressive reclamation of these areas would impede day to day operations. Where practicable, inactive areas resulting from either the construction or operation phase will be progressively reclaimed.

Progressive reclamation is proposed for the following facilities/locations:

3.1 Construction Facilities

Construction-related facilities will be reclaimed when they are no longer needed, progressively during operations. As construction related facilities are removed, the affected areas will be tested for elevated concentrations of regulated parameters in accordance with protocols at the time, covered with overburden (0.3 m) and revegetated. Construction laydown areas not required during the operations phase will be similarly tested and reclaimed.

In regards to the transmission line right of way (ROW), construction areas will be periodically cleaned up during construction, with a final clean-up undertaken on completion of the transmission line construction. If needed, affected lands will be stabilized by planting non-invasive native plants along watercourse banks, slopes and any other erosion prone areas. Any portions of the construction ROW not required to be maintained clear of incompatible vegetation to ensure line reliability will be allowed to naturally revegetate during operations. Vegetation maintenance during operations will be by mechanical means.

3.2 Open Pit

A berm (per Section 25 of the Mine Reclamation Code) or boulder fence will be placed around the perimeter of the open pit as appropriately sized material becomes available during construction and operation. The intent is that the boulder fence supplemented by appropriate signage will identify that a pit is present. Boulders of 2 m in height or larger, will be spaced approximately 0.6 m apart. Alternatively, appropriate security fencing could be installed.

Once the open pit reaches its maximum extent, the overburden slopes will be progressively recontoured to a stable condition. The overall angle of the overburden slopes will depend on the thickness of overburden and will generally range between 3 horizontal width to 1 vertical height (3H:1V) for overburden thicknesses of less than 25 m thick; to 4H:1V or flatter when thicker than 40 m in order to ensure an appropriate factor of safety. The open pit overburden slopes may be revegetated with native grasses to reduce erosion and promote slope stability during operations.

3.3 Stockpiles

Progressive rehabilitation of mine rock and overburden stockpiles will be undertaken where practical once the maximum height of each stockpile has been reached and/or as each lift is completed, to minimize the amount of reclamation required at closure. All stockpiles will be re-shaped as necessary and stabilized if needed.

The geotechnical properties of the overburden materials (primarily clay) generally support stockpiles of 20 to 30 m height with relatively shallow side slopes (8H:1V), to ensure stability. The side slope angle may be altered and optimized during operation, based on observations during the initial stockpile development. The overburden stockpile will be revegetated progressively, with final stabilization and revegetation occurring after overburden has been extracted for site reclamation. It is expected that progressive reclamation of the overburden stockpile will include contouring, stabilizing and revegetation. A significant amount of overburden will be used in final reclamation and a portion of the overburden stockpile may not be progressively reclaimed to allow for access to this material.

A height of up to approximately 50 m is expected for the west mine rock stockpile, comprised of an upper flatter surface and benched side slopes. Overall side slopes (horizontal : vertical) of approximately 6H:1V to 8H:1V are proposed, subject to additional investigations and operational monitoring results. Bench heights of up to 10 m could be utilized with internal slopes of 1.5H:1V to 2H:1V, although shallower bench heights and angles will likely be utilized initially. The west mine rock stockpile will be progressively reclaimed by contouring and stabilizing as necessary, and creation of islands of overburden cover to establish a base for stockpile revegetation. The minimum thickness of overburden cover will be 0.3 m over an area of not less than 40% of the mine rock stockpile surface. Experience with several other mine sites has shown that native plant species (herbs, shrubs and trees) will readily invade mine rock stockpiles even if there is no overburden cover, similar to the manner in which plants naturally invade bedrock terrain. The use of islands of overburden cover will accelerate this process and encourage native plant succession.

The east mine rock stockpile will be designed in a similar manner. A multi-layered cover is however, proposed to cover the east mine rock stockpile as it will contain PAG mine rock with a long term goal of inhibiting ARD. The side slopes will be covered by a layer of compacted clay till to shed water, topped by a layer of NPAG mine rock to consume oxygen, another layer of compacted clay till, a layer of clay till and a growth media to enable revegetation. The flat portion of the stockpile will have a similar cover, but will exclude the lowest clay till layer.

All stockpiled ore is proposed to be processed during operation and reclamation. As a result, reclamation of neither the low grade ore nor run-of-mine stockpile is anticipated to be required. Should it be necessary, the stockpiles are expected to be reclaimed in manner similar to the east mine rock stockpile.

Revegetation will occur as seeding, hydroseeding and/or hand planting of tree seedlings, as appropriate to expedite the colonization by indigenous species. Investigations will be completed to determine the feasibility of establishing specific wildlife habitats, such as those that might be used by Species at Risk (SAR), following closure. At a general level, the intent is to provide approximately 40% bare rock exposed at the west mine rock stockpile, in order to provide nesting habitat for the Common Nighthawk, while also helping to maintain an edge effect over the very long term which is preferred by whip-poor-will (COSEWIC 2009). The east mine rock stockpile and overburden stockpiles will be fully revegetated, with grasses and some trees.

3.4 Other Facilities

Environmental investigations for soil quality will be conducted periodically at the RRP site, followed by clean up, as needed. If presence of elevated concentrations of regulated parameters is suspected (for example, motor oil), soil / overburden will be tested in accordance with environmental regulations in effect at the time. The primary effects on soil that could be expected will result from the use / spillage of hydrocarbons (mainly fuel). Soils that have been affected will be excavated and treated on site or trucked off site to an appropriate licensed facility.

3.5 Revegetation Investigation Programs

Studies will be conducted during operations and progressive reclamation, to help ensure revegetation success at closure. The species mix or mixes for site revegetation will be determined through onsite test work programs, to be fine-tuned during progressive reclamation activities.

The planned test work program is expected to include:

- Potential for cash crop production;
- Further assessment of site area native plant communities to determine those species which are likely to be best suited for use during site revegetation;
- The preparation of mine rock test pads to conduct vegetation growth trials using various soil / overburden cover materials, seed mix and seedling planting arrangements;
- Determination of suitable seed and seedling sources to use during final reclamation efforts, focusing on climatically adapted plant and seed stocks; and
- Determination of the role of soil amendments and/or fertilizer to support revegetation.

While development of a physically and chemically stable site is important, research will also be undertaken to determine the applicability for habitat enhancement, such as for SAR.

If sufficient quantities of native seed mixes are not available at a feasible cost, or if the colonization success of native species appears poor, conventional non-invasive seed mixes will be used to stabilize soil and establish an initial vegetative cover. Once an initial vegetative cover is established, tree and shrub species from planting or the nearby forested areas are expected to invade the area, thereby progressively restoring native plant and wildlife habitat. RRR will also advance discussions with the nearby Emo Agricultural Research Station, as well as the Rainy River Soil and Crop Improvement Association to investigate various options for soil improvement in support landscape naturalization.

4.0 RECLAMATION MEASURES - ACTIVE FINAL CLOSURE

Final closure of the mine site will be undertaken following completion of all mining and processing operations, and a decision to close the site has been made. The subsections that follow outline the reclamation measures that will be undertaken for final closure of the RRP site and provide a summary of key guidance provided by the Ontario *Mining Act* and the Mine Reclamation Code of Ontario (the Code). The plan will be reviewed with the Township of Chapple and on agreement, any required zoning changes will be requested. A schematic of the proposed approach is provided in Figure 4.

4.1 Open Pit

Section 21 of the Code provides for the following strategies for reclamation and closure of open pits in order of preference:

- Backfilling (with mineral waste; preferred if feasible);
- Flooding (if fully justified);
- Sloping (if flooding or backfilling are not appropriate);
- Boulder fencing or berming (if all of the above are impractical); and
- Chain link fencing (if none of the above is practicable).

The Code also recognizes that different open pit closure strategies may be appropriate at different stages of closure. For example, boulder fence protection may be an appropriate measure until a pit is fully backfilled or flooded.

Final closure of open pits in Ontario generally includes flooding with surface water and/or groundwater, with either a natural, passive approach or enhanced through redirection of a water supply. It is proposed that the RRP pit will either be allowed to flood naturally or in an enhanced manner, to create a pit lake (Attachment 1) to assist with long term site water management. Enhanced flooding is preferred as it will accelerate the pit flooding and reduces the time until flooded, thereby reducing the time that PAG pit wall rock is exposed to the environment and potentially generating acid rock drainage / metal leaching (ARD / ML). It will also reduce the risk to the general public from inadvertent access / trespass and resultant injury. Additional water sources that could be used to enhance the natural flooding of the open pit include runoff from the TMA, stockpile drainages and natural watercourses (and potentially a portion of West Creek and Pinewood River flows).

The RRP open pit will be flooded to create a pit lake either passively through natural groundwater and precipitation inputs; or by active filling of the open pit, using water pumped from an alternate source such as seasonal fresh water inputs (Attachment 1). Other measures to be taken to reclaim the open pit progressively or at closure may include:

- Remove all infrastructure and equipment within the open pit and underground mine and clean up (petroleum hydrocarbons or explosives);

- Shape and revegetate overburden pit slopes to a stable condition and to facilitate riparian habitat along the pit lake margins;

- Block the entrance to the open pit; a boulder or traditional security fence will be installed around the pit perimeter during or following active mining operations to ensure safety while the pit is flooding;

- If necessary to prevent long term erosion such as from wave action, areas where the final pit lake will abut the reclaimed overburden slopes will be protected with clean rock or other means; and

- Develop a spillway to allow the pit lake to eventually overflow to the Pinewood River.

Flooding the open pit is expected to take several decades, depending on the quantity of runoff that is intercepted to fill the pit. By the time the pit floods to surface, the pit lake is expected to become stratified into an upper oxygenated layer and a lower deoxygenated layer. The upper oxygenated water layer is expected to be in the order of 30 m in depth, and is expected to contain generally low concentrations of metals. The lower deoxygenated layer will exhibit higher metal concentrations; but due to chemical stratification, the two layers are not expected to mix to any appreciable degree. If necessary, additional water quality treatment will be provided to achieve acceptable final effluent quality from the pit outflow prior to drainage into the Pinewood River.

While there is the potential that the pit will eventually overflow and the upper 30 m will not be metal-rich, the aquatic habitat within the open pit will be of low quality and be comprised of marginal littoral zone habitat. The low quality aquatic habitat is expected to result from the following: the ratio of shallow littoral habitat to total surface area will be excessively small due to the steep pit slopes in rock; the shoreline development factor (ratio of shoreline length to waterbody area) will be limited due to the uniform, relatively straight and unvarying shoreline; and the water column is likely to become anoxic at depth. Although some fish species are likely to incidentally colonize the flooded pit, there is no plan to enhance the ultimate pit for fish habitat or encourage colonization through the spillway.

During flooding, the pit ramp(s) will provide the primary means of egress for wildlife. Development of a specific emergency egress from the pit after flooding is not proposed, as the establishment of low gradient and stable overburden side slopes along portions of the final pit perimeter will provide sufficient means of egress for wildlife from the fully flooded open pit.

4.2 Underground Mine

At the completion of mining the underground workings must be closed out in accordance Ontario Regulation 240/00, Amended O.Reg. 307/12. Subsection 24(2) of the *Regulation* specifies the following in relation to the closure of underground workings:

> *All … mine openings to surface that create a mine hazard shall be stabilized and secured*; and
>
> *All surface and subsurface mine workings shall be assessed by a qualified professional engineer to determine their stability, and any surface areas disturbed or likely to be disturbed by such workings shall be stabilized.*

Infrastructure and equipment of value in the RRP underground workings will be removed and any waste cleaned up. The underground workings will then be allowed to flood naturally through groundwater inflow and potentially through the flooding of the open pit. It is not expected that any of the surface openings to underground will discharge to the environment during or after flooding.

The proposed ramp will measure approximately 6 m by 5.5 m, with a box cut on a bedrock outcrop to the immediate south of the process plant. At final closure the access ramp and portal will be inspected by a qualified professional engineer. Thereafter, and pending any unexpected findings, the portal and ramp will be sealed with NPAG mine rock over a distance of approximately 30 m from the portal entrance. This practice is often used in underground mining to construct backfill barricades and ventilation blocks and is a proven technique. The entire ramp opening will be backfilled and overfilled with mine rock to ensure that no potential entry point is visible or accessible. Once backfilled, it will be inspected again by a qualified professional engineer and certified. Thereafter, the area will be regraded, covered with overburden and revegetated.

Ventilation raises will be securely sealed in compliance with O.Reg. 240/00, Sec. 24 (2)(1) to prevent inadvertent access to the underground mine workings by the general public and wildlife. The reinforced concrete or steel caps used to secure these openings will meet all appropriate engineering and construction standards of the Code (Part 1).

Consideration will be given to whether any of the openings to underground can reasonably be re-developed as productive bat habitat, while still ensuring public safety in the long term.

4.3 Stockpiles

The RRP will include the following stockpiles:

- Overburden stockpile;
- West mine rock stockpile;
- East mine rock stockpile;
- Low grade ore stockpile; and
- High grade ore stockpile.

At the completion of mining, mineral waste stockpiles must be closed out in accordance with Ontario Regulation 240/00, amended O.Reg. 307/12, and the Code of the Ontario *Mining Act*. Section 24(2) of Regulation states the following:

> *All tailings, rock piles, overburden piles and stockpiles shall be rehabilitated or treated to ensure permanent physical stability and effluent quality.*

Section 59 (2) of the Code states for PAG or ML materials:

> *the quality of the environment is protected, the management plan [for waste rock stockpiles] shall consider, where appropriate,*
>
> - *The design and construction of covers and diversion works; and*
> - *The use of passive and active treatment systems.*

Section 71 of the *Code* states the following:

> *When revegetating waste rock storage areas … or other steeply sloped features, the following specific measures shall be considered, where appropriate:*
>
> - *Contouring to mimic local topography and blend into surrounding landscape.*
> - *The application of soil to a depth sufficient to maintain root growth and nutrient requirements.*
> - *The incorporation of organic materials, mulches and fertilizers based upon soil assessment.*
> - *The scarification or ripping of flat surfaces which may have been compacted by heavy equipment.*
> - *Improving site drainage to prevent water erosion on rehabilitated areas.*

A large proportion of the reclamation of the RRP stockpiles will occur progressively during operation in order to minimize double-handling of materials and facilitate long term stabilization.

4.3.1 Overburden Stockpile

Material from the overburden stockpile is proposed to be used for mine site reclamation both progressively and at closure. Any stockpiled material remaining at closure which has not already been reclaimed will be contoured for long term stability with an expected slope of approximately 8H:1V and revegetated by seeding or hydroseeding and shrub / tree planting. Runoff from the eastern portion of the overburden stockpile may be directed to the open pit to facilitate flooding of the pit and/or it may be released to the environment along with runoff from the remainder of the stockpile.

4.3.2 West Mine Rock Stockpile

Once no further NPAG material is required from the west mine rock stockpile for closure activities, minor recontouring of the remainder of the stockpile which has not been progressively reclaimed will occur. The majority of overburden cover will be developed to establish a base for stockpile revegetation. The minimum thickness of effective overburden cover will be approximately 0.3 m over an area of approximately 60% of the mine rock stockpile surface. A portion (approximately 40%) of the stockpile surface will be left as exposed NPAG rock, to provide nesting habitat for the Common Nighthawk and to encourage species that prefer edge habitat such as Whip-poor-will.

Revegetation of the west mine rock stockpile will be undertaken using a combination of hydroseeding, seeding and hand planting of shrub/tree seedlings. Native seed mixes will be used if reasonably commercially available, together with a nurse crop as appropriate, to re-establish nutrients and modify the local growth environment. Experience with several other mine sites has shown that native plant species (herbs, shrubs and trees) will readily invade NPAG mine rock stockpiles even if there is no overburden cover, similar to the manner in which plants naturally invade bedrock terrain; the use of overburden islands will accelerate this process. Runoff from the eastern portion of the east mine rock stockpile may be directed to the open pit to facilitate flooding and/or it may be released to the environment.

4.3.3 East Mine Rock Stockpile

A multi-layered encapsulation cover is proposed for the east mine rock stockpile as it will contain PAG rock, in order to achieve the goal of controlling ARD in the long term. To reduce precipitation infiltration and oxygen exchange with the PAG rock, a three layer sandwich cover will be placed over the side slopes of the east mine rock stockpile, and a two layer cover will be placed over the flatter areas progressively during operations and at closure.

The three layer sandwich cover over the side slopes will consist of:

- An initial 1 m thick, compacted layer of clay-rich till (silty-clay overburden) placed directly over the PAG mine rock;
- A 5 m layer of NPAG mine rock will be placed over the compacted silty-clay layer; and
- A final compacted silty-clay layer of overburden placed over the NPAG mine rock (2.5 m thick).

The two layer cover over the flatter areas will not have the initial compacted layer of silty-clay overburden (inner layer), but will have the other two layers: a NPAG rock layer and the top layer of compacted silty-clay overburden.

The compacted silty-clay layers will act as infiltration barriers and will each reduce the amount of water migration by 80 to 90%. The NPAG rock will primarily act as an oxygen consumption barrier as sulphides in the NPAG rock will react with oxygen (without creating ARD/ML) that manage to migrate through the upper compacted layer. The upper compacted layer will be sized to allow for soil desiccation, frost penetration and root penetration. A layer of organic soils will be spread over top to facilitate plant growth. Revegetation of the stockpile will be undertaken using a combination of hydroseeding, seeding and hand planting of shrub/tree seedlings. Native seed mixes will be used if reasonably commercially available, together with a nurse crop as appropriate, to re-establish nutrients and modify the local growth environment. Surface runoff and seepage from the east mine rock stockpile will continue to be directed to the mine rock pond for direction to the open pit; or potentially will flow directly to the open pit through ditching to facilitate flooding of the pit and allow ongoing management of potentially ARD/ML impacted waters (such as by means of an effluent treatment facility or deep water outflow into anoxic conditions in the pit lake) in accordance with ARD/ML management at that time (Section 5.0).

4.3.4 Ore Stockpiles

It is intended that the high grade and low grade ore stockpiles will be depleted during operations. Should an ore stockpile remain at closure, it will be managed similar to PAG in the east mine rock stockpile with a multi-layer sandwich cover, and seeded. Runoff and seepage will be directed to the open pit as part of the passive water management system.

4.4 Tailings Management Area

At the completion of mining the TMA must be closed out in accordance with Ontario Regulation 240/00, amended O.Reg. 307/12, and the Code. Section 24(2) of Regulation 240/00 states the following:

> *All tailings, rock piles, overburden piles and stockpiles shall be rehabilitated or treated to ensure permanent physical stability and effluent quality.*

Sections 35 and 36 of the Code state:

> *The objective of this Part of the Code is to ensure the long term physical stability of tailings dams and other containment structures.*
>
> *The procedures and requirements set out in the Dam Safety Guidelines published by the Canadian Dam Safety Association shall be given due regard by all persons engaged in the design, construction, maintenance and decommissioning of tailings dams and other containment structures.*

Section 72 of the Code states:

> *When revegetating tailings surfaces, the following reclamation measures shall be considered, where appropriate:*
>
> - *Contouring to provide accessibility and good surface drainage while controlling surface erosion.*
> - *Removing any crests prone to wind erosion or creating/planting live wind breaks.*
> - *The scarification or ripping of crusted surfaces.*
> - *The incorporation of organic materials and mulches.*
> - *Correcting the pH and adding fertilizer based upon soil assessment and vegetation requirements.*
> - *Applying soils or a gravel barrier.*

The principal concerns associated with closure of the RRP TMA involve long term slope stability, erosion control, drainage, vegetation cover and aesthetics, as well as prevention of ARD from the tailings. As the tailings solids are PAG, they must be isolated from exposure to oxygen at closure to prevent ARD development. From geochemical testing, the lag time to ARD onset is estimated at approximately 30 years. ARD development can be constrained through the exclusion of the oxygen needed for the reaction to occur. Oxygen exclusion can be achieved through development of an approximately 2 m or deeper water cover, or by means of an approximately 2 m or thicker low permeability overburden (or other) cover. Either alternative will keep the tailings solids saturated, restricting oxygen transport within the tailings pore spaces, and will act as a diffusion barrier restricting oxygen in the atmosphere from contacting the tailings surface.

During closure, the central portion of the tailings surface will have enhanced flooding by raising the operating pond surface so that the pond covers a larger area, but not to the extent that ponded water will contact the perimeter dams. For dam safety reasons, it is preferred that the permanent water cover should not come in contact with the TMA dams. A perimeter zone of exposed tailings beach will be maintained to keep the central pond away from the dams. This zone of exposed tailings beach along with a contingency area where the water cover might not be retained during drought conditions will be covered with a low permeability layer of overburden, to ensure cover during seasonal water level fluctuations. The overburden cover will be seeded or hydroseeded with a native seed mix or equivalent.

A drainage way / spillway will be developed to connect the central pond with the TMA perimeter spillway designed to pass the peak of the probable maximum flood (the most severe flood reasonably possible for the drainage area). Dam structures containing the TMA will be designed with adequate safety factors to provide overall long term safety and stability. No additional physical works are proposed during closure.

4.5 Buildings and Infrastructure

Subsection 24(2) of O.Reg. 307/12 of the *Ontario Mining Act* states the following:

> *All buildings, power transmission lines, pipelines, waterlines, railways, airstrips and other structures shall be dismantled and removed from the site to an extent that is consistent with the specified future use of the land.*
>
> *All machinery, equipment and storage tanks shall be removed from the site to an extent that is consistent with the specified future use of the land.*

It is generally interpreted that buildings and equipment, or parts thereof, that are not suitable for re-sale or re-use offsite, or for sale as scrap, can be permanently stored in an approved demolition landfill on the mine site, in accordance with a site-specific Provincial approval.

4.5.1 Buildings and Equipment

All buildings and infrastructure at the RRP site will be inventoried, cleaned as necessary and dismantled, with the exception of infrastructure required for long term water quality management (if any) and facilities needed for site management / security.

General demolition wastes will be placed in an approved, onsite demolition landfill. Demolition wastes will consist of non-hazardous materials such as concrete, steel, wallboard and other inert materials. The demolition landfill will likely be developed in an opening left within the overburden stockpile or adjacent to the east mine rock stockpile, Final design of this facility will be developed during operation once the volume of demolition wastes can be more accurately determined. As this landfill is not required until closure of the property (approximately 18 years hence), RRR will complete the design of the demolition landfill closer to that date, recognizing that the Provincial EA and environmental approvals process and design requirements are likely to have changed by that time.

Salvageable machinery, equipment and other materials will be dismantled and taken off site for sale or reuse if economically feasible. Alternatively, these items will be cleaned of oil and grease where appropriate, and deposited in the onsite demolition landfill. Gearboxes or other equipment containing hydrocarbons that cannot be readily cleaned will be removed from equipment and machinery and trucked off site for disposal at a licensed facility.

All unnecessary petroleum products, chemicals (including mill processing chemicals), and associated wastes remaining at the RRP site will be removed from site shortly after operations cease. Where practical, unused products will either be returned to the suppliers, or they will be made available to other possible users of these materials in the general area if appropriate. Fuel required for closure activities will be stored in double-walled Enviro tanks, and the balance of diesel fuel remaining at the end the closure phase will be taken off site by tanker truck. Empty fuel tanks and other tanks not required to support post-closure activities, will be removed from site and sold as scrap or reused, if economically feasible. Otherwise, they will be transported to an approved landfill off site. Used oil and any remaining waste chemicals, as well as any special management (hazardous) waste will be taken off site by a licensed disposal company.

The stock of explosives will be depleted towards the end of operations and any remaining explosives disposed of in accordance with regulatory requirements at the time of closure. Explosives will be managed at closure by the mining contractor in accordance with applicable environmental, and health and safety requirements.

Concrete foundations of these structures will be demolished to within 0.5 m of grade surface, infilled with NPAG mine rock or overburden, as needed, and covered with overburden to support revegetation.

A site investigation will be conducted at the onset of closure to identify soils that may be affected by hydrocarbons or chemicals. Soil materials found to exceed the appropriate cleanup criteria for hydrocarbons will be remediated at an approved bioremediation facility onsite, or removed off site to a licensed waste management facility.

If there is reason to suspect an area of soil has been affected by chemicals other than hydrocarbons, soil samples will be collected and tested. If the applicable regulatory requirements are exceeded, an appropriate method of disposal will be sought in consultation with the relevant authorities.

4.5.2 General Infrastructure

All surface pipelines not used for post-closure water management will be removed and disposed of in the demolition landfill if other alternatives (recycle, resale as scrap etc.) are not available. Any surface lines used for fuel dispensing or which have been affected with hydrocarbons, will be cleaned before being deposited within the demolition landfill, or they will be hauled off site to a licensed disposal facility as appropriate. Any buried pipelines will also be removed, or rendered in an acceptable state.

The demolition landfill containing only non-hazardous domestic and demolition wastes will be reclaimed at completion of closure activities by capping with 1 m of overburden or equivalent material and revegetated with seeding or hydroseeding, and hand planting with trees (or as otherwise required by applicable environmental approvals).

Aggregate quarries and pits will be reclaimed progressively during operations for long term stability and to encourage wildlife and bird habitat if practical. Reclamation will be completed consistent with the filed closure plan and the intent of the *Aggregate Resources Act*. In addition, reclamation of any facilities permitted under the *Aggregate Resources Act* will comply with those standards. While natural flooding will be encouraged, any exposed lands (and particularly for sand and gravel pits) will be redeveloped if practical into a patchy habitat, comprised of clumps of trees, open grassed areas and approximately 40% bare ground to encourage slow re-growth and longer term maintenance of the patchy habitat Whip-poor-will prefer.

Areas impacted by heavy traffic or otherwise compacted will be scarified to encourage drainage and vegetation growth. All impacted areas will be covered with a 0.3 m or greater thickness of overburden and revegetated.

4.5.3 Transmission Line and Substations

The 230 kV transmission line and onsite distribution lines will be left intact to provide site power during closure, and to operate any mine water management systems that might be required to actively manage water quality following closure, until it can be demonstrated that this power source is no longer required (or can be reasonably replaced by another means of power). It is expected that the local 13.8 kV distribution line will remain in place, at least in part, to assist with post-closure site management.

Once a decision has been made that 230 kV transmission line power to the site is no longer required for reclamation purposes, RRR will consult with Hydro One Networks. The transmission line segment that connects the RRP site to the Fort Frances / Kenora 230 kV line will either be transferred to Hydro One Networks or dismantled, unless another user takes over responsibility for operation and maintenance of the line. Access to the 230 kV transmission line for demolition purposes will by a winter road or off the permanent road network at that time. Wooden poles may be either cut off at surface or fully removed. If deemed appropriate and in consultation with regulatory authorities, a number of the structures could remain in place at strategic locations for use by raptors.

Demolition materials will be transported to a recycling facility if appropriate, or disposed of in an approved landfill. The ROW corridor will be allowed to naturally revegetate and additional work is not proposed unless erosion management is required. Associated substations will be dismantled and equipment sold, recycled or landfilled.

4.5.4 Roads

At the completion of mining, site infrastructure must be closed out in accordance with Ontario Regulation 240/00, as amended by O.Reg. 307/12. Subsection 24(2) of the Regulation specifies the following in relation to roads, pipelines and transmission lines:

All transportation corridors shall be closed off and revegetated to an extent that is consistent with the specified future use of the land.

Local site roads constructed for the RRP and not required for monitoring or other purposes will be scarified and covered with a 0.3 m or greater thickness of overburden and revegetated. Related culverts will be removed sequentially and banks revegetated or stabilized by clean rock or equivalent to prevent erosion. Access roads within the site boundary required for post-closure monitoring, site maintenance or other required access, will be maintained in an operational state until such time that they are no longer needed. Discussions will be held with the Township of Chapple to determine which, if any, roads should remain. It is assumed that the east access road will remain in place to provide access to any remaining landowners north of the RRP site.

The Highway 600 realignment will remain in its realigned state and managed by the MTO or other government entity.

4.6 Impoundment Structures, Watercourse Diversions and Site Drainage

4.6.1 Watercourse Diversions

All watercourse diversions developed to support the RRP operations are expected to remain in place at closure.

West Creek will be left in its diversion alignment to preserve fish habitat compensation, unless it is determined during closure planning and consultation, that returning West Creek to its original route through the open pit is preferred. There is a possibility, at RRP closure, to divert a portion of West Creek flows during large runoff events, or the entire watercourse to the open pit to facilitate flooding. RRR would consult with relevant government departments and interested parties prior to advancing this option.

Clark Creek will also be left in its diversion alignment as its original route will be covered by the east mine rock stockpile. The diversion will be fully stabilized during operation and no closure-related activities are anticipated.

The stockpile pond and a minor drainage will be diverted away from the low grade ore / east mine rock stockpile and process plant area. The pond and diversions will be stabilized during operation and will remain in place at closure.

4.6.2 Impoundment Structures

The RRP includes a number of impoundment structures to facilitate water management, including:

- TMA (Section 4.4);
- Water management pond;

- Water discharge pond;
- Constructed wetland berms;
- West Creek pond;
- Clark Creek pond;
- Stockpile pond; and
- Mine rock pond.

Subsections 71(1), (5) and (7) of the Code state the following relative to site preparation and drainage control for final closure, respectively:

- *Contouring to mimic local topography and blend into the surrounding landscape.*

- *Improving site drainage to prevent water erosion on rehabilitated areas.*

- *Contouring and sloping of impoundment areas must be integrated with engineering design.*

The general preference is to remove drainage features at closure, and to contour and restore the associated lands wherever possible, unless the drainage features in question are integral to overall site water management following closure. Otherwise it will be the responsibility of the proponent to continue to monitor the function and stability of any such drainage features in accordance with Section 66 of the Code.

A number of impoundments will be created to support creation of fish habitat for compensation purposes (Clark Creek pond, West Creek pond and stockpile pond). These will remain in place at closure provide fish habitat unless otherwise determine through discussions with regulators.

The water management pond will no longer be required once the TMA is fully reclaimed and is capable of generating a runoff of acceptable water quality or the runoff is directed to the open pit to assist with pit flooding / water quality control. At such time maintaining water holding dams will create an unnecessary RRP liability. The water management pond dams will therefore be breached to prevent retention of water. Upstream dam faces that become exposed will be revegetated. The water discharge pond dam will be similarly breached once it no longer has a water management function.

The berms used to develop the constructed wetland will be left in place as this system is designed to operate passively, and will have stabilized as a wetland complex during operations. The alternative of removing these berms at closure could prove problematic, as such action could cause a release of wetland sediments to the Pinewood River.

The mine rock pond will collect runoff and seepage from the east mine rock stockpile during operations, as well as receiving pumped minewater from open pit and underground dewatering. At closure, the only water reporting to the mine rock pond will be runoff and seepage from the east mine rock stockpile which will then be directed to the open pit to help flood the pit, and to help manage site runoff and seepage. At closure there will likely still be some value in maintaining the mine rock pond, but the quantity of ponded water could be considerably reduced by lowering the dam and stabilizing in place.

Terminal ponds associated with MMER ditching will be maintained until such time as the site (or if applicable individual site components) become a recognized closed mine such that MMER monitoring is no longer required. At such a time, any applicable pond impoundment structures will be breached and the residual pond sites will be stabilized and restored.

4.6.3 Other Drainage Works

Drainage works existing at the end of mine operations will include the following:

- Ditching along onsite roads;
- Ditching and associated berms bordering the open pit designed to limit runoff entry into the pit;
- Emergency collection ditches / ponds associated with tailings pipelines;
- Toe ditching around the perimeter or portions of the perimeter of the TMA dams, east mine rock stockpile and west mine rock stockpile;
- Any drainage works associated with potential aggregate pits or quarries; and
- Other ditches required for general site area drainage enhancement, such as in and around the plant site area.

The general preference is to remove drainage features, and to contour and restore the associated lands wherever possible, unless the drainage features in question are integral to overall site water management following closure.

Toe berm ditches around the stockpiles, if not already fitted with rock check grade controls, will be fitted with such grade control structures at closure to minimize the potential for excessive long term erosion. It is expected that the ditch along the eastern side of the west mine rock stockpile / overburden stockpile will be re-directed to the open pit to enhance flooding. Assuming there are no water quality concerns, the western ditching will be allowed to discharge to the environment.

Ditches associated with the east mine rock stockpile and ore stockpile (if any ore remains at closure) will be diverted directly or indirectly to the open pit to facilitate filling and to allow for future water quality management if needed (Section 5.0)

Ditches bordering onsite roads will remain in place. Any culverts associated with road ditching will be removed if the road serves no further function and is reclaimed. If not already present, small rock check grade control structures will be placed in ditches at strategic locations to be determined by slope, soil type and catchment area, to minimize the potential for excessive long term erosion. Emergency collection ditches associated with tailings pipelines will be left in place and fitted with rock check grade controls, as required, to minimize the potential for excessive long term erosion. Ditches constructed to prevent runoff from entering the open pit during operation (if any) will be reshaped to restore natural drainage and allow the open pit to fill at a faster rate.

Other mine site area ditching required for generalized site drainage will be either filled in or stabilized with rock-check structures to prevent long term excessive erosion, as appropriate.

The pit protection berm will be left intact as part of a protection barrier to prevent inadvertent pit entry while the open pit is flooding during post closure, except as required to develop a discharge spillway to the Pinewood River.

4.7 Revegetation

The primary aims of the mine site reclamation / revegetation program are to:

- Control erosion and ensure physical stability;
- Improve the appearance and aesthetics of the RRP site;
- Enhance natural vegetation growth;
- Establish a self-sustaining vegetative cover; and
- Begin the process of vegetative succession and habitat restoration.

The planned test work program includes:

- An assessment of site area native terrestrial and riparian plant communities to determine species which are likely best suited for use during site revegetation;
- The preparation of test pads to carry out vegetation growth trials, using various soil cover and seed mix combinations;
- Determination of suitable seed sources to use during final reclamation efforts, focusing on climatically adapted plant and seed stocks; and
- Determination of the role of soil amendments and/or fertilizer to support initial revegetation efforts, if any.

Revegetation of disturbed areas will be accomplished by a combination of seeding or hydroseeding of grasses, legumes and other successful species identified during progressive reclamation. Hand planting of native tree species and natural regeneration will also be employed. The species mix or mixes for RRP site revegetation will be determined through: consultation with the forestry industry and local regulatory authorities; an onsite test work program during the operations phases; and fine tuned during progressive reclamation. These programs will help ensure revegetation success at closure.

4.8 ARD Inhibition

Three areas of potential ARD/ML have been identified for the RRP post-closure: the TMA, east mine rock / ore stockpiles and open pit walls. The reclamation approach discussed in the preceding sections has been developed to inhibit ARD/ML development in the long term by excluding the oxygen supply by the following means:

- TMA: cover with water and low permeability overburden;
- East mine rock / ore stockpile: use of a complex encapsulation cover with residual seepage directed to the open pit (potentially at depth); and
- Pit walls: enhanced flooding.

A contingency is available to re-direct discharge and seepage from the TMA to the open pit at closure, along with the east mine rock / ore stockpile runoff and seepage. If water quality dictates, the runoff and seepages can be treated prior to entering the pit lake or the pit lake can be treated, to ensure that when the open pit fills in the future, any discharge will meet regulatory requirements.

4.9 Reclamation Schedule for Final Closure

Once a decision has been made to permanently close the RRP site, it is anticipated that the major closure activities (initiation of pit flooding; removal of buildings, machinery, equipment and infrastructure; reclamation of the TMA and stockpiles; restoration drainage works; the removal of consumables and wastes; and general site area restoration/revegetation) will be completed within a period of one to two years, for those activities not completed during progressive reclamation.

Water quality monitoring will occur over several phases during the post closure period. Monitoring of various site aspects such as water quality, revegetation and TMA dam stability is expected to continue over an extended period of time.

Flooding of the open pit is required prior to development of a closed out condition. Until the open pit is flooded and in a stable hydrologic condition, the site cannot be considered closed out and regular ongoing inspection and maintenance will be necessary. Current modelling (Attachment 1) suggests that enhanced flooding will take approximately 25 years to fill the open pit to surface (21 years to the top of bedrock).

Similarly, the ongoing monitoring of site water drainage is expected to be required until such time as it can be demonstrated that site drainage is fully compatible with the downstream aquatic environment.

5.0 MEASURES CONTINUING AFTER ACTIVE FINAL CLOSURE

Some activities will still be required for the ongoing management of the RRP site following completion of the RRP active closure phase. Stability and environmental monitoring is required to confirm that implementation of the closure plan was successful and that facilities are operating as intended (Section 6).

Ongoing water management is required in conjunction with the flooding of the open pit, as well as monitoring the quality of water in contact with PAG materials that could potentially cause ARD/ML.

5.1 TMA Seepage

As described in Section 4.4, tailings in close proximity to the TMA dams will be covered with low permeability overburden and vegetated, or covered with a permanent water cover. It is fully expected that water to be discharged from the TMA will be of a quality that can be released to the environment through the constructed wetland.

A constructed wetland will be developed during RRP construction and operation phases, to take advantage of the natural topography present and support the additional natural clarification of excess water. For TMA effluent and seepage discharged through the constructed wetland, further reductions in residual metal and ammonia levels are expected as wetlands adsorb residual metals and take up residual ammonia as a nutrient. The efficiency of such uptake is seasonally dependant and most significant during the active plant growing season.

While the TMA basin has a base of natural clay till and along with clay-core dams, there is the potential for seepage to occur from the TMA during operations and post closure. Seepage will be collected in a series of collection ditches constructed around the TMA during operations and into closure. Depending on the seepage quality it may be directed by gravity to the constructed wetland for final polishing, or may be directed to the open pit for treatment along with the east mine rock stockpile seepage either prior to release into the open pit or in the pit lake itself.

5.2 Open Pit Flooding and Treatment

5.2.1 Open Pit Flooding

During the initial stages of open pit flooding, seepage and runoff from the east mine rock stockpile / ore stockpile area, surface runoff from a portion of the overburden stockpile and west mine rock stockpile, along with groundwater inflows and precipitation is proposed to be directed to the open pit (moderately enhanced flooding scenario - Attachment 1). This flooding may be enhanced by water taken from the TMA, as well as from natural watercourses during periods of high flow to further reduce the length of time for complete flooding to occur.

During the stage when pit water level will remain below the bedrock surface, the open pit water is expected to contain elevated levels of acidity and metals. No environmental impacts are anticipated as the water level will be well below grade and not accessible to wildlife.

A treatment plan will be implemented to improve the water quality of the open pit waters that could eventually be discharged to the environment, if needed. This could include either in pit treatment or alternatively a water treatment plant could be installed to treat water being discharged into the open pit for pH and / or specific metals prior to discharge.

5.2.2 Long Term Configuration

Once a sufficient water cover is established with a thermocline and chemocline that prevents mixing of the water column, water treatment will cease if appropriate, associated infrastructure removed and the site reclaimed.

It is expected that residual seepage from the encapsulated east mine rock stockpile may be ARD/ML impacted and as a result, will likely be discharged from an outfall pipe to below the thermocline / chemocline in the pit lake to promote treatment and prevent mixing with surface waters. Reducing conditions below the chemocline will result in ongoing metal and sulphide removal from the water column through precipitation.

Riparian habitat will be created during closure along the overburden slopes for the pit lake. Riparian habitat will improve the pit lake habitat quality and organic detritus will help maintain reducing conditions in the deeper parts of the pit lake.

6.0 MONITORING

A post-closure monitoring program compliant with the Code will be implemented to ensure reclamation measures remain effective and continue to provide a high level of public and environmental protection.

An annual written report detailing the results of physical, chemical and biological monitoring will be submitted to the Director of MNDM, and other regulatory authorities as per other agreements and approvals requirements. Should unexpected conditions arise which will or may adversely affect the RRP site or surrounding environs, an assessment of potential impacts and mitigation measures will be defined for implementation in consultation with regulatory agencies.

6.1 Physical Stability Monitoring

The key objective of physical stability monitoring post-closure is to demonstrate the safety of the site by ensuring that all lands, water management structures and other RRP related structures are left in a long term stable condition. Another objective is to identify any indications of physical instability and take appropriate corrective measures.

Physical stability monitoring will be carried out as a minimum, in accordance with the Code (Part 8) during closure. Dam Safety Inspections will be conducted by a qualified professional engineer annually and Dam Safety Reviews will be conducted every 10 years. A final inspection of the stockpiles and exposed pit slopes will be conducted by a qualified professional engineer on completion of the stabilization and revegetation program.

6.2 Chemical Stability Monitoring

Chemical stability monitoring will be conducted during the closure and post-closure phases in accordance with regulatory requirements including environmental approvals and other commitments (if any), and as a minimum, in accordance with the Code. A conceptual surface and groundwater monitoring program is outlined below which may require revision to reflect environmental approval requirements.

6.2.1 Effluent Quality and Flows

During post-closure Years 1 and 2 which will cover the period of active reclamation, water samples will be collected and rates of flow measured as applicable, from all effluent discharges on a monthly basis when discharging, including those listed below and others not currently identified:

- TMA, water management pond and water discharge pond discharges to the constructed wetland (flow and water quality) while ponds are in place and discharging;

- TMA seepage to constructed wetland when sufficient water is present;

- Constructed wetland discharge to Loslo Creek (Cowser Municipal Drain) / Pinewood River;

- Sewage treatment plant effluent discharge;

- East mine rock stockpile, ore stockpile (if present), surface drainage and seepage;

- Mine rock pond and stockpile pond discharge; and

- Overburden stockpile, west mine rock stockpile perimeter ditching and general site drainage ditches.

Samples will be analyzed for the following parameters as a minimum, as well as in accordance with Environmental Compliance Approvals and other applicable regulations (such as O.Reg. 560/94 and the federal Metal Mining Effluent Regulations if applicable at the time).

Monthly sampling / calculation of effluent quality for the following parameters will be carried out during discharge periods, generally as per the Code (Part 5):

pH	hardness	acidity	alkalinity
total suspended solids	total dissolved solids	total ammonia	un-ionized ammonia
conductivity	sulphate	cyanide (total and free)	total aluminum
total arsenic	total cadmium	total calcium	total copper
total iron	total lead	total mercury	total molybdenum
total nickel	total zinc		

For post-closure Years 3 through 10, water samples will be collected and analyzed on a quarterly basis (pending appropriate regulatory approvals) and rates of flow measured as possible from:

- TMA discharge;

- TMA seepage to constructed wetland;

- Constructed wetland discharge to Loslo Creek (Cowser Municipal Drain) / Pinewood River;

- East mine rock stockpile, ore stockpile (if present), surface drainage and seepage;

- Mine rock pond discharge;

- Overburden stockpile and west mine rock stockpile perimeter ditching; and

- Open pit (water quality only).

Samples will be analyzed for the parameters listed above as a minimum, as well as in accordance with Environmental Compliance Approvals and other applicable regulations (such as O.Reg. 560/94 and the federal MMER if applicable at the time).

All samples will be collected in accordance with standard sampling protocols (Protocol for the Sampling and Analysis of Industrial / Municipal Wastewater, Ministry of Environment, January 1999), or the industry equivalent at that time, including: the use of laboratory supplied sample bottles from a certified laboratory, the use of appropriate sample bottles and preservative for the type of parameter(s) being analysed, the collection of quality assurance / quality control samples (for example, blanks, duplicates, etc. at a number equal to 10% of the total number of samples), and the appropriate packaging / storing / transporting of the samples to a Canadian Association for Laboratory Accreditation certified laboratory. The program will also include an assessment of the results against data quality objectives, as well as mitigation and response to any results that exceed quality assurance / quality control objectives.

Assuming that there are no water quality concerns expressed during the first 10 years after operations cease, effluent monitoring will cease at all locations except:

- TMA discharge and seepage;
- East mine rock stockpile runoff and seepage;
- Ore stockpile (if present) runoff and seepage; and
- Open pit surface water quality, which will be maintained annually during the active treatment phase described in Section 6.1.2.

Monitoring will cease from the TMA and stockpile, once is can be demonstrated that water quality is consistently good and that ARD/ML is not of concern. Once the open pit consistently maintains a surface cover with good water quality suitable for discharge, pending approval from regulatory authorities at the time, effluent monitoring will cease.

6.2.2 Background Reference Sites and Receiver Water Quality

During post-closure Years 1 and 2, water quality will be monitored on a quarterly basis when flow is present, upstream and downstream of discharge and runoff / seepage releases at established monitoring locations in the following receiving waterbodies: West Creek / Loslo Creek and Pinewood River. Water samples will be analyzed / results calculated (as a minimum) for:

pH	hardness	acidity	alkalinity
total suspended solids	total dissolved solids	total ammonia	un-ionized ammonia
conductivity	sulphate	cyanide (total and free)	total aluminum
total arsenic	total cadmium	total calcium	total copper
total iron	total lead	total mercury	total molybdenum
total nickel	total zinc		

During post-closure Years 3 through 10, water quality will be monitored on a quarterly basis when flow is present for the parameters listed above (as a minimum), upstream and downstream at previously established monitoring locations in the following receiving watercourses: West Creek / Loslo Creek and the Pinewood River.

Assuming no water quality concerns expressed during this period, background and receiver water quality and flow monitoring will cease after Year 10 at all stations except Pinewood River (upstream and downstream), which will be monitored on an annual basis until monitoring demonstrates no concerns related to ARD/ML. Water quality monitoring at the Pinewood River stations will include the same parameters as listed above.

6.2.3 Groundwater Quality

Groundwater samples will be obtained from wells established proximal to the TMA and east mine rock stockpile, on a quarterly basis during post-closure Years 1 and 2 and on an annual basis during post-closure Years 3 through 10. Any additional groundwater sampling related to Environmental Compliance Approvals and/or other applicable regulations will also be completed.

Groundwater samples will be analyzed / calculated (as a minimum) for:

pH	hardness	acidity	alkalinity
total dissolved solids	conductivity	sulphate	ammonia (tot./ unioniz.)
dissolved aluminum	dissolved arsenic	dissolved cadmium	dissolved calcium
dissolved copper	dissolved iron	dissolved lead	dissolved mercury
dissolved molybdenum	dissolved nickel	dissolved zinc	cyanide (total and free)

All samples will be collected and analyzed in accordance with standard sampling methods/ protocols.

At the completion of the 10 year post-closure groundwater monitoring period, the results will be reviewed to determine future monitoring requirements, if any. Assuming there are no groundwater quality concerns, groundwater quality monitoring will cease and monitoring wells will be decommissioned according to relevant legislation at that time.

6.2.4 Sediment Quality

Sediment samples will be collected once per year during the aquatic resources investigations (post-closure Years 1, 4, 7 and 10, described below) from:

- West Creek / Loslo Creek; and
- Pinewood River system.

Sediment will be analyzed for:

pH	aluminum	arsenic	cadmium
calcium	copper	iron	lead
mercury	molybdenum	nickel	zinc
loss on ignition			

6.2.5 Other Aspects

The level of flooding in the open pit will be recorded annually to assess the accuracy of the pit flooding estimate.

6.3 Biological Monitoring

Biological monitoring will be conducted during the closure and post-closure phases in accordance with approvals / applicable regulations (such as the federal MMER) and any other commitments.

Commencing during the first year of active reclamation and continuing at three year intervals thereafter (post-closure Years 1, 4, 7 and 10), fish habitat and fisheries assessments, including benthos investigations will be completed for:

- West Creek / Loslo Creek; and
- Pinewood River.

Game fish tissues will be monitored for parameters of potential concern from the Pinewood River system, coincident with these programs.

SAR surveys will be conducted during post closure Years 1, 4, 7 and 10 to document SAR communities consistent with regulatory requirements.

Monitoring of revegetation success is also proposed. Objectives for site revegetation are long term physical stability of the site (erosion control), provision of habitat, improvement of overall site aesthetics and if possible, re-use of the site by avian SAR. To assist these objectives, revegetated areas will be inspected near the end of each growing season (annually) during the post-closure phase, to determine the success of the program (adequate cover and resistance to erosion) and the need for any remedial work, until such time as vegetation has been successfully established. The revegetation success will be assessed and documented fully at Year 10.

7.0 EXPECTED SITE CONDITIONS AFTER CLOSURE

7.1 Land Use

The overall intent of closure from a natural environment perspective is to reclaim the mine site area to a naturalized and productive condition on completion of mining. The terms naturalized and productive are interpreted to mean a reclaimed site without infrastructure unless required for site maintenance and management, that while different from the existing environment, is capable of supporting plant, wildlife and fish communities and other applicable land uses.

7.2 Site Topography

Relative to predevelopment site conditions (Figure 3a, b), the principal topographic changes to the site will include the following (Figure 5):

- Initially the open pit will be approximately 400 m deep, but will eventually form a pit lake with a surface elevation slightly higher than Pinewood River to the south.
- Development of the reclaimed TMA, with maximum projected dam heights of 20 to 25 m above ground surface;
- Overburden stockpile of up to approximately 30 m above the ground surface;
- West mine rock stockpile with a maximum height of about 50 m above the ground surface;
- East mine rock stockpile having a maximum height of approximately 40 m above surface, although will be primarily situated in a shallow valley; and
- Aggregate pits / quarries, if below the groundwater level, will flood as part of their reclamation.

7.3 Local Surface Waters

7.3.1 Open Pit

The open pit will gradually flood to create a pit lake. This process is anticipated to take as little as approximately 21 years to flood to the top of bedrock or 25 years until fully flooded by enhanced flooding (Attachment 1). During the first portion of flooding, the pit lake will be set deep in the open pit and will not be capable of supporting aquatic life because of poor water quality.

During later stages of open pit flooding, a water treatment plant may be required to assist in the creation of a layer of clean water at the top of the lake. Some of the treatment required may include the stimulation of natural aquatic microorganism through the addition of micronutrients into the flooded pit lake. Vegetated overburden slopes may provide some riparian habitat and the pit may eventually become colonized by aquatic life. Much of the pit lake will be very deep and will not support aquatic life. The final pit lake elevation will controlled by a spillway to the Pinewood River.

7.3.2 Clark Creek (Teeple Drain) System

During operations, the Clark Creek (Teeple Drain) system will be altered due to the development of the east mine rock stockpile across the Clark Creek valley. The Clark Creek diversion will redirect flows from the upper Clark Creek through a new pond to the Unnamed Tributary 8A, a tributary that flows into the Pinewood River. This diversion will remain in place beyond closure.

The Clark Creek system provides aquatic habitat to various minnow species, which should remain functional along the diversion, Clark Creek Pond and further upstream. Currently Unnamed Tributary 8A is ephemeral and contains fish habitat for small minnow species. During 2012 baseline studies, five species of minnows were found stranded in a small intermittent pool. With Clark Creek being diverted to Unnamed Tributary 8A and supplying flows, fish survival may be improved in the Tributary 8A alignment.

7.3.3 West Creek System

The West Creek system will be significantly altered during RRP operations. Two of its southern tributaries will be overprinted by the process plant and plant site runoff will be diverted east to the stockpile pond. During operations, West Creek will be diverted around the open pit. At final closure, the West Creek diversion will remain in place to maintain fish habitat constructed along the diversion. The West Creek pond dam will be lowered to facilitate fish movement.

7.3.4 Marr Creek System

The Marr Creek system will mostly be removed by the RRP operations. Marr Creek headwaters will report to the TMA and its partial permanent water cover, although the large headwater wetland complex will remain intact. The lower reaches off Marr Creek will be overprinted by the overburden and west mine rock stockpiles.

7.3.5 Loslo Creek (Cowser Drain) System

The Loslo Creek system will also be largely removed by RRP operations. Headwaters and the upstream wetland complex will report to, or be overprinted by the TMA and its partial permanent water cover. The TMA will drain to the constructed wetland, located along the former lower reaches of Loslo Creek, which drains into a municipal drain (Cowser Drain) and then into the Pinewood River.

7.3.6 Pinewood River System

The Pinewood River system will generally remain unaffected from project activities, with the exception of the above tributaries, although project activities and water takings could result in a flow decrease. It is anticipated at closure that discharge of treated effluent to the Pinewood River downstream of McCallum Creek will cease. Drainage and runoff from the TMA will report to the constructed wetland for polishing prior to final discharge. Overall, RRR expects to meet PWQO values or background, following mine closure with the mitigation strategies proposed. If for any reason ongoing monitoring data collected during operations should indicate that this expectation is likely to change, the Closure Plan will be amended accordingly at that time.

While the open pit is flooding, flows in the Pinewood River flows will be marginally reduced as local groundwater and runoff from the east mine rock stockpile area, overburden stockpile and west mine rock stockpile will be directed to the open pit. A portion of the Pinewood River spring freshet may be diverted to the open pit to accelerate flooding.

7.4 Local Groundwater

At closure, the open pit and underground workings will be fully developed and generally dry, and the groundwater drawdown will be at close to its greatest extent. The groundwater model (AMEC 2013) predicts the zone of influence (ZOI; a minimum one metre drawdown of the upper bedrock groundwater in the base case scenario) to extend approximately 2.5 to 3.5 km from the edge of the open pit. No private wells will be located within the estimated drawdown cone.

At closure, mine workings and the open pit will begin to flood and groundwater will rise. Once the open pit is completely flooded, groundwater levels are expected to be at near pre-mining levels.

7.5 Terrestrial Plant and Wildlife Communities

A listing of the vegetation habitat that will be affected by the RRP site can be summarized as approximately:

- 11.5 km^2 hardwood forest;
- 2.8 km^2 agriculture;
- 2.2 km^2 coniferous swamp;
- 1.4 km^2 meadow and shallow marsh;
- 1.2 km^2 coniferous forest;
- 1.2 km^2 fen;
- 1.1 km^2 cultural meadow;
- 0.3 km^2 thicket swamp;
- 0.2 km^2 open water; and
- 0.1 km^2 rock and mineral barren.

These vegetation communities will be replaced by the following (Figure 3):

- Pit lake and various ponds (TMA pond, West Creek Pond, mine rock pond and smaller ponds associated with the constructed wetland);

- Lands actively revegetated using grasses and trees; and

- Areas allowed to naturally revegetate (transmission line, portion of west mine rock stockpile left as barren rock and aggregate pit left as barren ground).

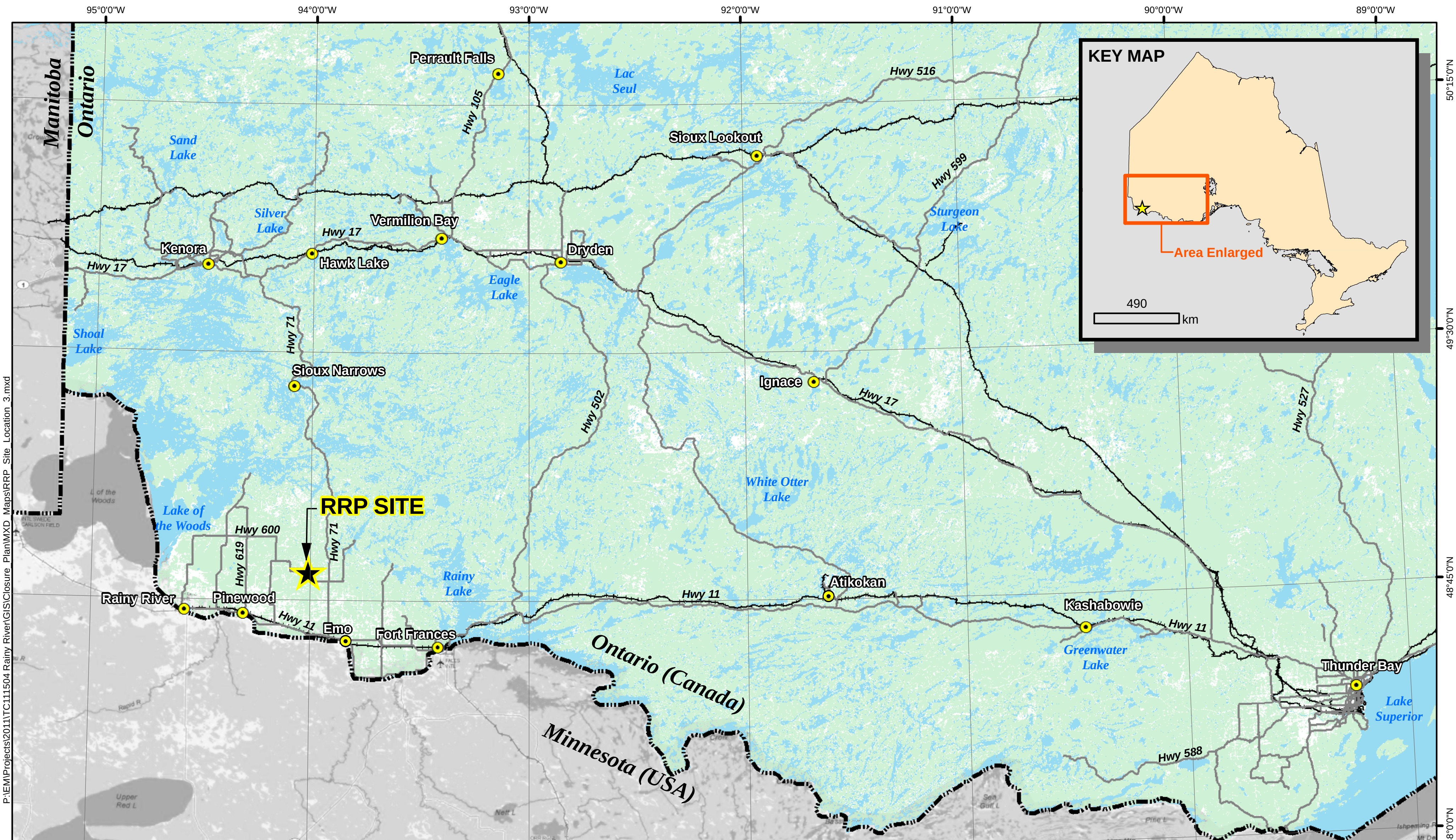
The closed out RRP site is expected to blend in with the surrounding natural land to provide reasonable productivity. To assess the health and quality of the restored habitats and their transition to the unaffected adjacent vegetation units, annual monitoring of the restored vegetation areas will be conducted in Years 1 through 3 of post closure with annual monitoring continued until Year 10 of post closure. Success of the closure measures will be demonstrated by established vegetation growth in the restored areas and use of the areas by wildlife.

Efforts have been made to minimize the area affected by mine facilities and to mitigate any disturbance to animals. Following mining disturbed areas will be reclaimed to a naturalized state. It is recognized that there will be an effect on local wildlife during the construction, operations and closure phase of the RRP. It is expected that upon closure wildlife will gradually return to the site to amenable habitat. The success of this return will be monitored during the first 10 years after mining ceases.

8.0 REFERENCES

AMEC 2013. Rainy River Gold Project Hydrogeology Modelling Report.

Committee on the Status of Endangered Wildlife in Canada. 2009. COSEWIC Assessment and Status Report on the Whip-poor-will *Caprimulgus vociferus* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.



LEGEND

- RRP Site
- Regional Communities
- Provincial / National Border
- Regional Road / Highway
- Railway

NOTES:
- Ontario base data extracted from Land Information Ontario (MNR) data warehouse, Queen's Printer for Ontario, 2011-2012
- Base data outside of Ontario extracted from ESRI DeLorme World Basemap

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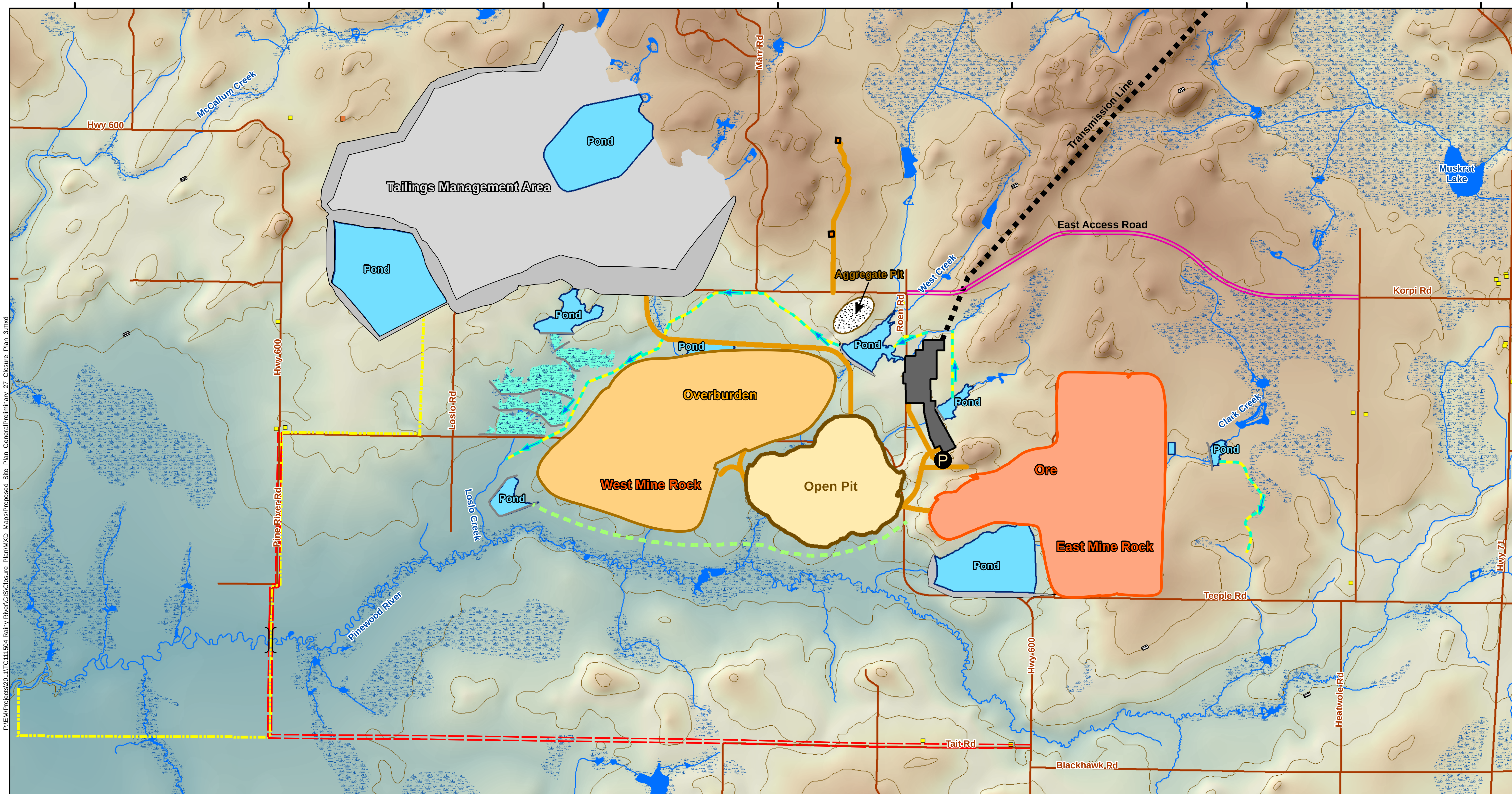
RAINY RIVER PROJECT

RRP Project Location

Datum: NAD83
Projection: UTM Zone 15N

PROJECT Nº: TC111504	**FIGURE: 1**
SCALE: 1:1,800,000	DATE: October 2013

0 25 50 100 150 200 250 Kilometres



LEGEND

- Residence-House
- Lodging Cabin-Occasional Use
- Roads
- Contours, 10 m interval (LIO-MNR)
- Watercourses
- Low-lying Area

Elevation Colour Ramp

- High ground (max elev. 418 m)
- Low ground (min elev. 340 m)

Proposed Site Features

- Underground Portal
- Open Pit
- Plant Site / Ancillary Facilities
- Explosives Facilities
- Water Management Pipelines
- Major Watercourse Crossing
- Site Roads
- Pond
- Aggregate Pit
- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Pit Protection Berm / Access Road
- Constructed Wetland
- Dams
- Highway Re-alignment
- East Access Road
- Transmission Line
- Watercourse Diversion

0 1 2 4 6 8 10 Kilometres

Source / Notes:
- Road data extracted from Land Information Ontario, Ontario Road Network, MNR
- Background topographic and elevation data extracted from MNR Land Information Ontario
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.

Datum: NAD83
Projection: UTM Zone 15N

N E S W

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RAINY RIVER PROJECT

Conceptual Site Plan

PROJECT N[o]: TC111504	FIGURE: 2
SCALE: 1:39,500	DATE: October 2013

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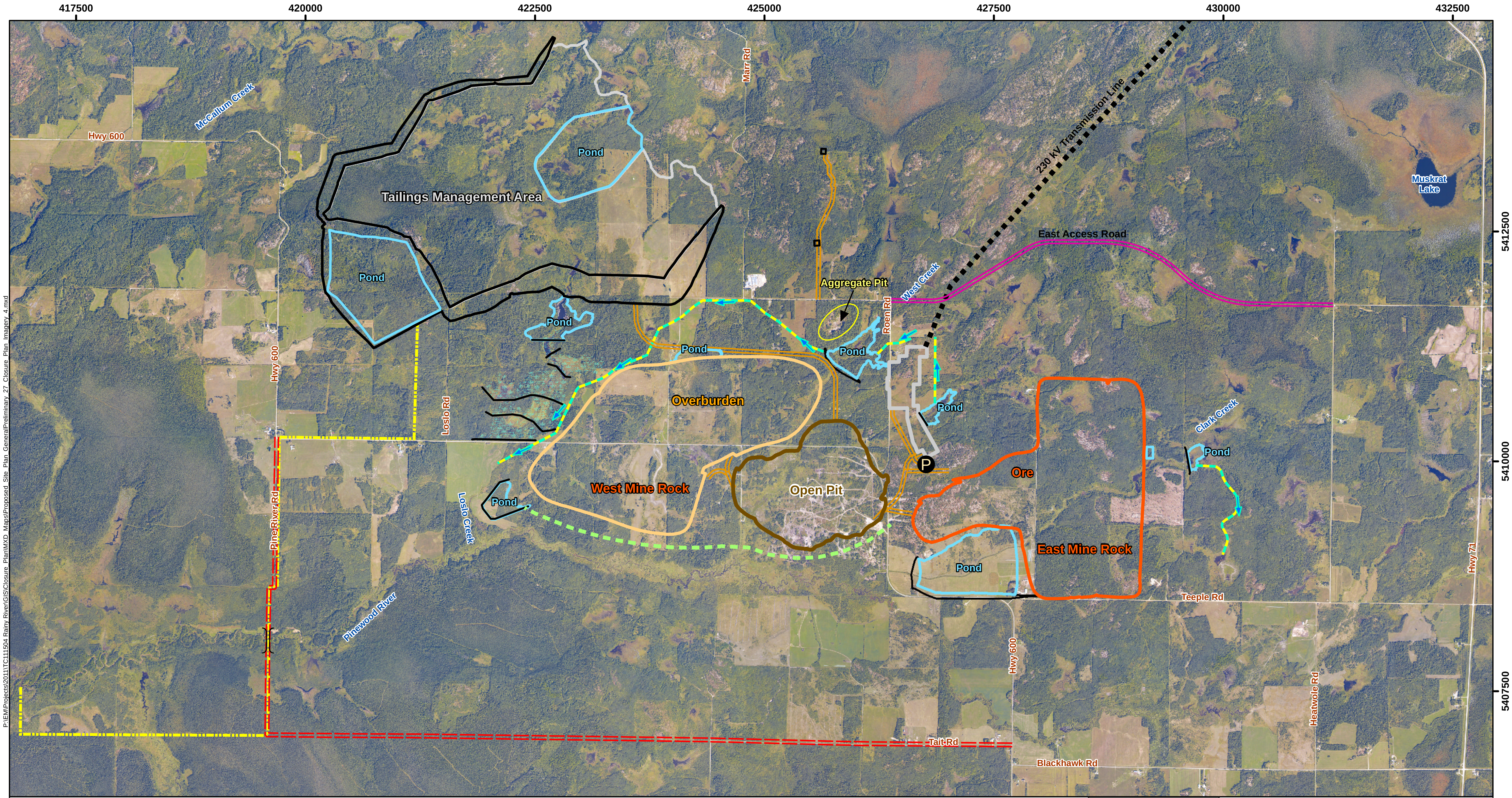

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LEGEND

- Underground Portal
- Open Pit
- Plant Site / Ancillary Facilities
- Explosives Facilities
- Water Management Pipelines
- Major Watercourse Crossing
- Site Roads
- Pond
- Aggregate Pit
- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Pit Protection Berm / Access Road
- Constructed Wetland
- Dams
- Highway Re-alignment
- East Access Road
- 230 kV Transmission Line
- Watercourse Diversion

Notes:
- Aerial imagery provided by RRR scene date is summer 2011
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.

Datum: NAD83
Projection: UTM Zone 15N

0 1 2 4 6 8 10 Kilometres

N W E S

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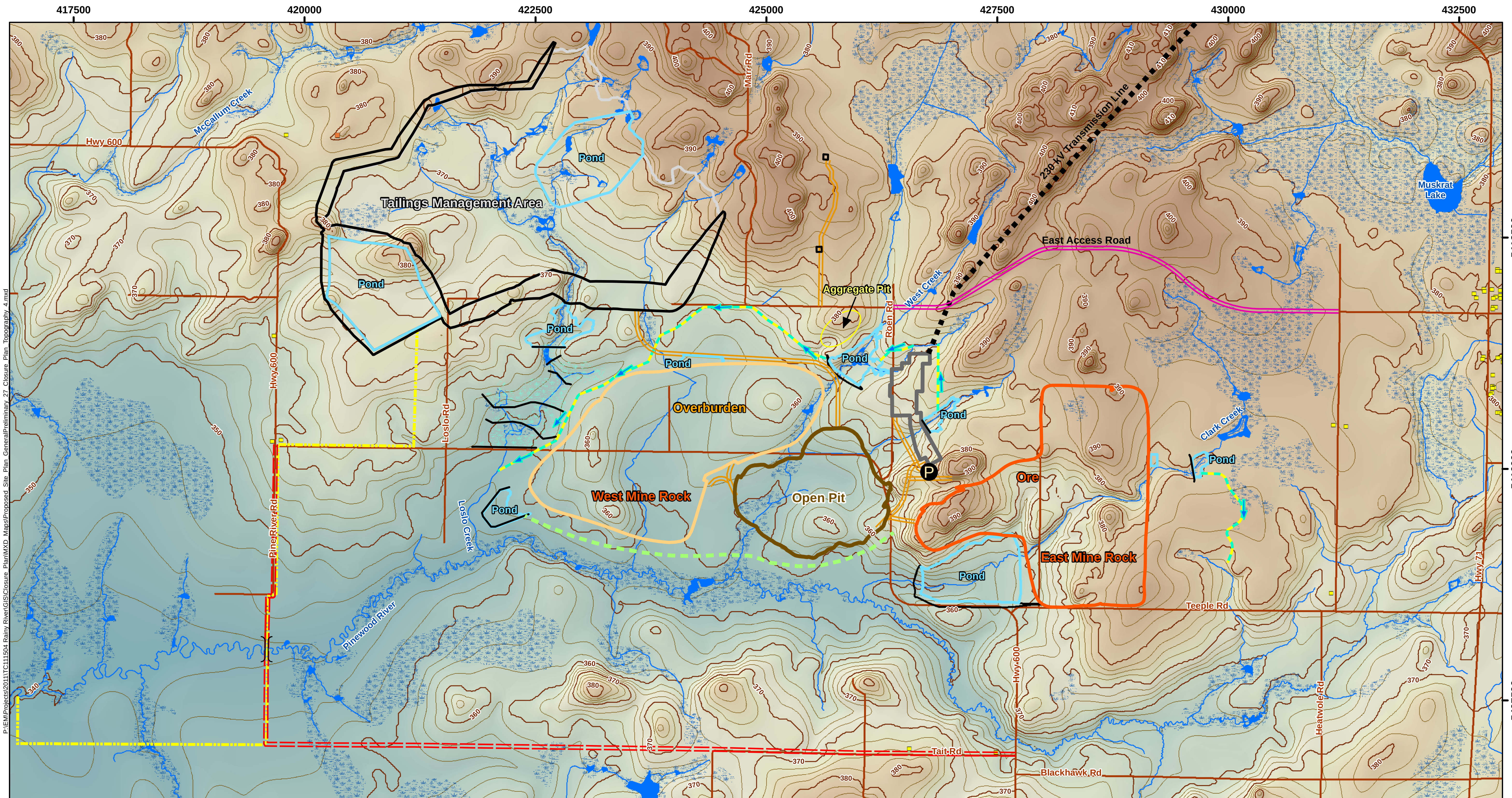
RAINY RIVER PROJECT

Predevelopment Conditions - Imagery

PROJECT N°: TC111504	**FIGURE: 3a**
SCALE: 1:39,500	DATE: October 2013



LEGEND

- Residence-House
- Lodging Cabin-Occasional Use
- Roads
- Contours, 2.5 m interval (labelled at 10 m interval)
- Watercourses
- Low-lying Area

Elevation Colour Ramp

High ground

Low ground

Proposed Site Features

- Underground Portal
- Open Pit
- Plant Site / Ancillary Facilities
- Explosives Facilities
- Water Management Pipelines
- Major Watercourse Crossing
- Site Roads
- Pond
- Aggregate Pit
- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Pit Protection Berm / Access Road
- Constructed Wetland
- Dams
- Highway Re-alignment
- East Access Road
- 230 kV Transmission Line
- Watercourse Diversion

Source / Notes:
- Road data extracted from Land Information Ontario, Ontario Road Network, MNR
- Background topographic and elevation data extracted from MNR Land Information Ontario
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.

Datum: NAD83
Projection: UTM Zone 15N

0 1 2 4 6 8 10 Kilometres

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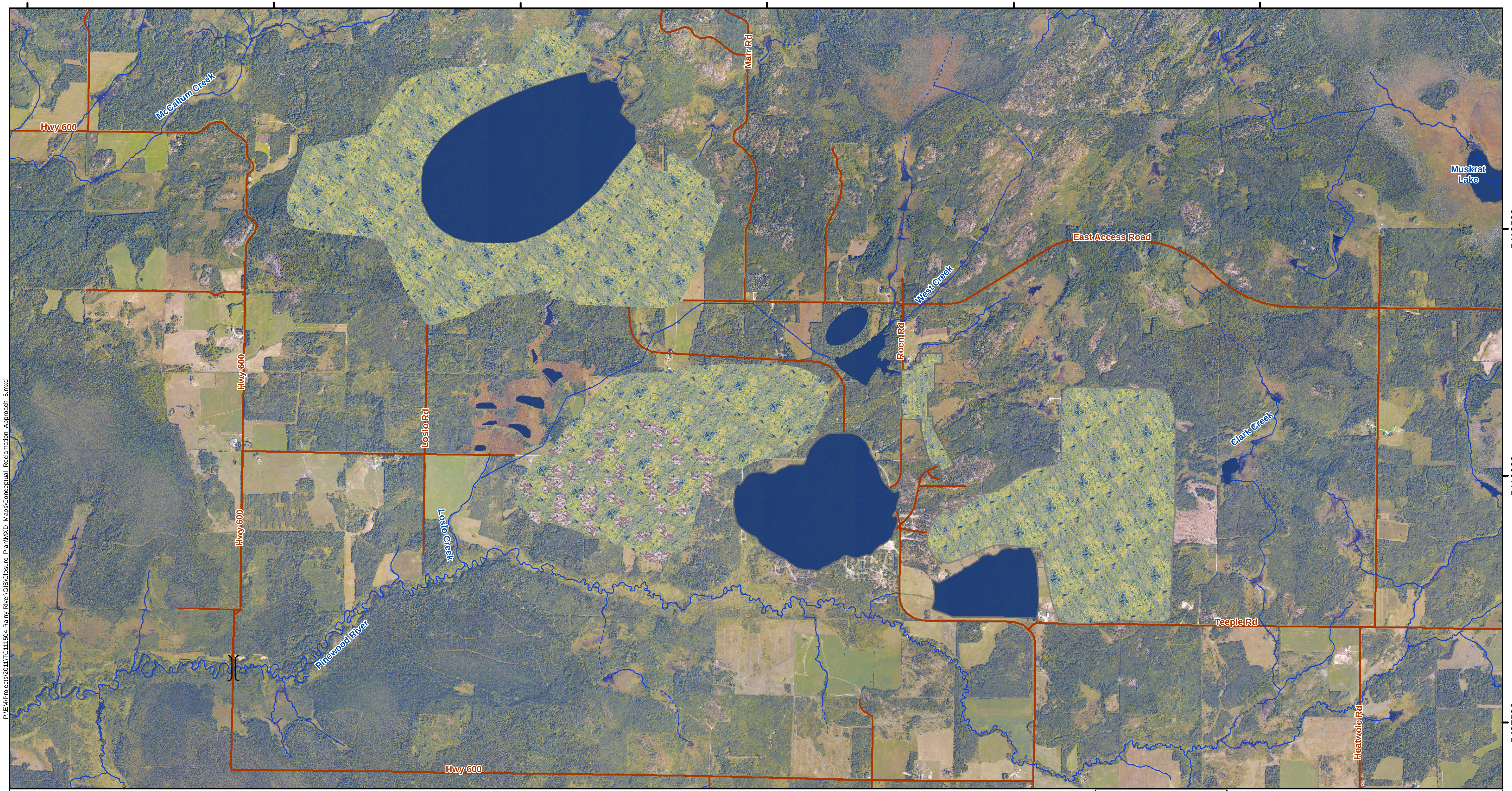
RAINY RIVER PROJECT

Predevelopment Conditions - Topography

PROJECT N°: TC111504	FIGURE: 3b
SCALE: 1:39,500	DATE: October 2013



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LEGEND

- Rock
- Revegetated
- Wetland
- Pond/Flooded
- Watercourses
- Roads

Notes:
- Aerial imagery provided by RRR scene date is summer 2011
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.

Datum: NAD83
Projection: UTM Zone 15N

0 1 2 4 6 8 10 Kilometres

N E S W

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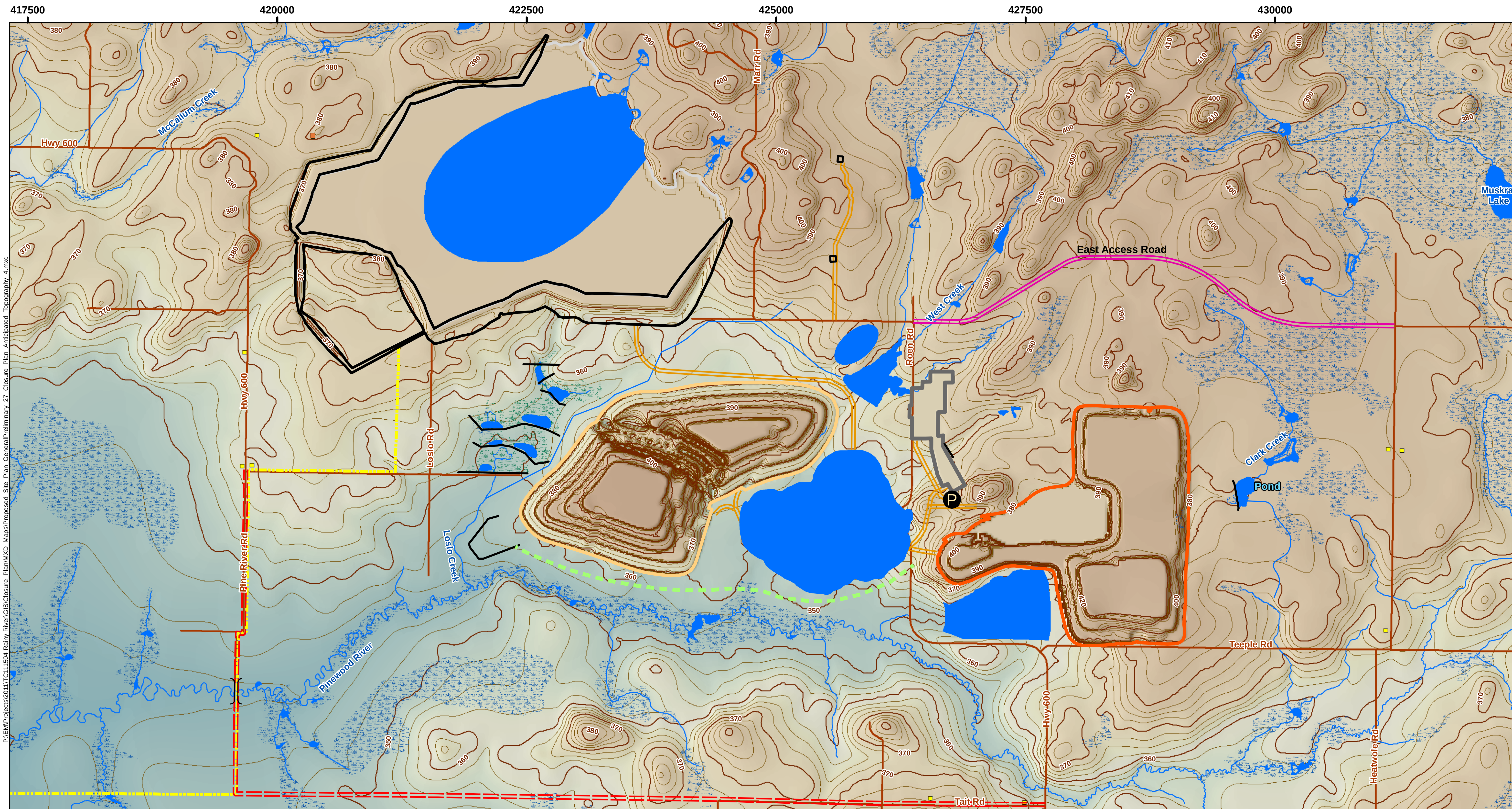
RAINY RIVER PROJECT

Conceptual Post Closure Layout

PROJECT N°: TC111504	**FIGURE: 4**
SCALE: 1:37,000	DATE: October 2013



LEGEND

- Residence-House
- Lodging Cabin-Occasional Use
- Roads
- Contours, 2.5 m interval (labelled at 10 m interval)
- Watercourses
- Low-lying Area

Elevation Colour Ramp

High ground

Low ground

Proposed Site Features

- Underground Portal
- Open Pit
- Plant Site / Ancillary Facilities
- Explosives Facilities
- Water Management Pipelines
- Major Watercourse Crossing
- Site Roads
- Pond
- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Pit Protection Berm / Access Road
- Constructed Wetland
- Highway Re-alignment
- East Access Road

Source / Notes:
- Road data extracted from Land Information Ontario, Ontario Road Network, MNR
- Background topographic and elevation data extracted from MNR Land Information Ontario
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.

Datum: NAD83
Projection: UTM Zone 15N

0 1 2 4 6 8 10 Kilometres

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RAINY RIVER PROJECT

Anticipated Topography

PROJECT N^{o}: TC111504	FIGURE: 5
SCALE: 1:37,000	DATE: October 2013

Rainy River Project

APPENDIX 1

TECHNICAL MEMORANDUM
RAINY RIVER PROJECT
ESTIMATE OF OPEN PIT FLOODING TIME

TECHNICAL MEMORANDUM

To	**Kyle Stanfield**	File no	**TC111504**
From	**Peter Dekker, AMEC** **Norman Schwartz, AMEC**	cc	**Sheila Daniel, Dave Simms,** **Steve Sibbick, AMEC**
Tel	**905-568-2929**		
Date	**May 13, 2013; Revised Oct 8, 2013**		

Subject **Rainy River Project: Estimate of Open Pit Flooding Time**

Introduction

This technical memorandum presents the assumptions, methodology and results of the assessment carried out by AMEC Environment & Infrastructure (AMEC) of the estimated times to flood the open pit of the Rainy River Project (RRP) following mine closure. Three post-closure scenarios were evaluated in terms of the estimated duration required to flood the open pit:

1) Direct Flows: direct precipitation on the pit and its perimeter, drainage from upstream West Creek catchments, and seepage from the covered east mine rock stockpile;

2) Enhanced Drainage: utilization of drainage from the east and west mine rock stockpiles, in addition to direct precipitation on the pit and its perimeter, and drainage from upstream West Creek catchments. Runoff from surrounding catchments is considered as water taken from Pinewood River, and was limited by the assumed maximum diversion acceptable to regulators (diversion of 20% of Pinewood watershed flows during the spring freshet, and 15% for the summer and fall flows); and

3) Maximum Diversion: redirection of all available site runoff into the pit for quickest possible time to fill the open pit (the percentage of Pinewood watershed flows taken exceeds 20%).

The following summarizes the key data sources and constraints assumed for the pit lake model:

- The open pit characteristics were determined based on the Feasibility Study design criteria;

- Total pit lake volume was estimated to be 249,770,550 cubic metres (m^3) when full;

- The volume of the underground mine workings is less than 2% of that of the open pit volume, therefore the time to flood the underground workings is minor and is considered negligible;

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- Groundwater inputs to the pit were varied as a function of pit lake surface elevation; and

- Seepage of groundwater out of the pit lake was assumed to be negligible and was not included in this analysis.

Climate Data and Inputs

Climate data and inputs to the pit flooding model are summarized below:

- Daily precipitation data from Environment Canada Climate Station 6020559 in Barwick, ON from 1979 to 2011 was applied. The mean annual precipitation is 695 millimetres (mm).

- Total precipitation in each month was computed as a random normal variable with means and standard deviations shown in Table 1 and limited to the minimum and maximum in the period of record. This varies the precipitation on a month-by-month and year-by-year basis to represent the variability in climatic conditions that may be expected over a several year period.

- Snow accumulation was assumed to be 100% of total precipitation for January and February, and 50% for March, November and December, with the rest considered as rainfall (as shown in Table 2).

- Snowmelt was computed in March, April, and May as a percentage of the total snow accumulation over the winter months and based on the monthly distribution shown in Table 2.

- Precipitation available for runoff was computed in each month as the total precipitation minus the snow accumulation plus the snowmelt (water equivalent).

- Pond evaporation data was taken from the nearest applicable data source (Atikokan Climate Station 6020379). The mean annual value applied was 600 mm.

- Lake evaporation was varied each month according to the distribution shown in Table 2.

- Evaporation losses from the pit were calculated as a function of lake evaporation for the month and the pit lake surface area from the previous month.

Pinewood River Flow and Allowable Water Diversions

The monthly flow available in the Pinewood River just downstream of the confluence with Loslo Creek was estimated using historical precipitation and flow data based on the total catchment area of 10,700 hectares (ha). Daily precipitation data from the Barwick, Ontario climate station and flow data from the Pinewood River near Pinewood (Environment Canada gauge 05PC011) from the period of 1979 to 1998 were used to determine a 26% average runoff coefficient for the Pinewood River catchment. Table 3 summarizes the results of this analysis.

There were no recorded flows for the months of November to January for all years in the 1979 to 1998 periods. Consequently runoff in these months is excluded from the average runoff coefficient for the Pinewood watershed; however runoff during the winter is expected to be very small. The maximum allowable water takings from Pinewood River were assumed to be 20% during the spring melt (March to June), 15% during the summer and fall (July to November), and zero in the winter.

Flow in the Pinewood River was estimated using the total upstream catchment area including the catchments of tributaries to Pinewood River within the RRP site including Loslo Creek, Marr Creek, West Creek and Clark Creek. Therefore, any runoff taken from these catchments is considered as water taken from Pinewood River.

Potential Catchment Sources

A site wide monthly water balance model was developed to estimate inflows and losses to the open pit following the closure of the RRP to estimate the time required to flood the pit. The catchment areas and runoff coefficients were taken from the AMEC's flow model. The potential sources to the pit lake are summarized in Table 4.

Groundwater Sources

A MODFLOW groundwater flow model was developed to estimate seepage rates into the fully dewatered pit and underground mine workings (AMEC 2013), and was subsequently modified to estimate groundwater seepage rates into the partially flooded open pit after closure. Using this model, groundwater contribution to the partially flooded open pit was estimated at flooded elevations of 0, 100, 200, 300, 320 and 346 metres above sea level (masl; Figure 1). The elevation of 346 masl is the approximate elevation of the confluence of West Creek and the Pinewood River, and taken to represent the fully flooded pit.

The modified groundwater flow model was run in steady-state mode for each successive flooded elevation and groundwater inflow rates were calculated. The approach assumed that redistribution of aquifer hydraulic head in response to changes in flooded pit elevation would occur faster than the rise of water level in the partially flooded pit.

The provided groundwater seepage rates were fitted to a rational formula:

$$y = \frac{a + bx}{1 + cx + dx^2}$$

where y represents the groundwater inflow rate (m^3/day), x represents the pit elevation (m), a is 3300, b is -8.7, c is 2.4E^{-3} and d is -4.3E^{-7}. The relationship yielded a correlation coefficient of 0.999. Groundwater inflow rates do not exceed 3,300 m^3/day, and decrease to 0 m^3/day as the pit lake elevation approaches 350 masl. During the winter months (January and February), the groundwater component is the sole source of inflow into the open pit for all modelled scenarios.

Detailed Description of the Three Pit Filling Scenarios

Several sources of inflows to the pit lake were considered for each of the three scenarios. The drainage areas are provided in Figure 2, and the inflows and outflows for each scenario are summarized in Figure 3. It was assumed that the only losses would be due to evaporation from the open pit lake for all scenarios.

Scenario 1 considers direct precipitation and runoff from the open pit and surrounding catchments that naturally drain into the open pit (A, B, C), in addition to seepage from the covered east mine rock pile (D) and groundwater inflows, but does not include surface runoff from the covered east mine rock stockpile. Scenario 1 suggests the re-direction of runoff from the east mine rock stockpile to the Pinewood River, which is a less likely option.

Scenario 2 includes, in addition to the above inflows, runoff from the east mine rock stockpile (D and E) from the Clark Creek watershed, and runoff from overburden stockpile and west mine rock pile watershed divide (F) from the Marr Creek watershed. This scenario accounted for seasonal variability in river flow, where 100% of allowable flow diversion was utilized to fill the pit. The allowable flow diversion is defined as the diversion of a water flow volume equivalent to 20% of Pinewood River flows during the spring freshet period (March – June), or 15 percent of the summer / fall flow (July – November), measured for the Pinewood River at the Loslo Creek inflow (watershed area 107 km^2)

Scenario 3 modelled the quickest possible time to fill the open pit, with no upper limit to allowable flow diversion from the Pinewood River. Scenario 3 accounted for all of the flows outlined in Scenario 1, in addition to 100% of the east mine rock stockpile runoff (D and E), runoff from the west mine rock and overburden stockpile areas (G and H), 20% of the runoff from the West Creek diversion (I), and discharge from the tailings management area (TMA) (J). It was assumed that only 20% of the runoff from catchment I would be available to fill the pit as this water supplies a diversion channel that may support fish habitat and therefore could not be allowed to dry out. The total adds to a diversion of, on average, 45% of the Pinewood River flows and exceeds the assumed allowable flow diversion acceptable to Provincial Regulators.

Model Results

Each of the three scenarios: Direct Flows, Enhanced Drainage and Maximum Diversion, were evaluated based on the time to completely fill the open pit and the percent of the Pinewood River flow that is diverted into the open pit. The results are summarized in Table 5 and Figure 4.

Under Scenario 1 the estimated time to fill the pit lake is approximately 97 years and the average diversion of Pinewood River flows is 12%.

Scenario 2 is considered the optimum scenario, as it reduces the estimated pit filling time to approximately 73 years and has an average diversion of 17%, achieving the assumed maximum possible 15% equivalent diversion of Pinewood River flows during the summer and fall seasons and a 20% equivalent diversion of Pinewood River flows during the spring freshet.

Under Scenario 3 the estimated time to fill the pit lake is much less at approximately 26 years; however, the average diversion of water from the Pinewood River is equivalent to 44% of the flow measured for the 107 km^2 watershed, which exceeds the assumed 20% limit for maximum allowable diversion. As such, this scenario is considered impractical as it would cause too great a reduction of Pinewood River flows.

The time taken to reach the top of the mine rock surface would be considerably shorter than the time taken to reach the pit surface elevation (Figure 4). The estimated time to flood the open pit to the mine rock-overburden interface is approximately 68, 54, and 21 years, for Scenarios 1, 2, and 3, respectively.

Uncertainties in the pit flooding estimates are due to variability in climatic conditions (i.e. precipitation, snow accumulation, snowmelt, evaporation etc.) in addition to the estimated runoff coefficients. The drainage areas were estimated based on the current Site plan, and may be subject to change.

Table 1: Precipitation by Month (mm) from Barwick, Ontario Climate Station (1979 – 2011)

Month	Minimum	Maximum	Mean	Standard Deviation
Jan	7.4	72.2	28.3	15
Feb	2	49.4	24.1	12.5
Mar	4.8	127.1	29.7	22.4
Apr	0.4	111.6	40	25.9
May	18.4	167.3	68.3	39.2
Jun	33.2	358.5	113.8	67.5
Jul	16.4	285.2	99	54.5
Aug	19.8	170	84	39.9
Sep	6	169.6	80	42
Oct	4.6	139.8	56.2	32.5
Nov	7.2	97.4	41.7	24.9
Dec	9.6	56.6	29.7	13.4

Statistics based on data from January 1979 to December 2011.

Table 2: Monthly Distribution of Snow Accumulation, Snowmelt and Lake Evaporation

Month	Snow Accumulation (% of Total Precipitation)	Snowmelt (% of Total Snow Accumulation)	Lake Evaporation (% of Annual Evaporation)
Jan	100%	0%	0%
Feb	100%	0%	0%
Mar	50%	12%	0%
Apr	0%	69%	0%
May	0%	19%	20%
Jun	0%	0%	20%
Jul	0%	0%	24%
Aug	0%	0%	19%
Sep	0%	0%	12%
Oct	0%	0%	4%
Nov	50%	0%	0%
Dec	50%	0%	0%
Total	**--**	**100%**	**100%**

Table 3: Pinewood River Runoff Coefficient and Assumed Maximum Allowable Water Taking

Month	Runoff Coefficient	Assumed Maximum Allowable Water Taking From Pinewood River
Jan	N/A	0%
Feb	N/A	0%
Mar	20%	20%
Apr	37%	20%
May	48%	20%
Jun	18%	15%
Jul	28%	15%
Aug	9%	15%
Sep	12%	15%
Oct	33%	15%
Nov	N/A	15%
Dec	N/A	0%
Average:	**26%***	--

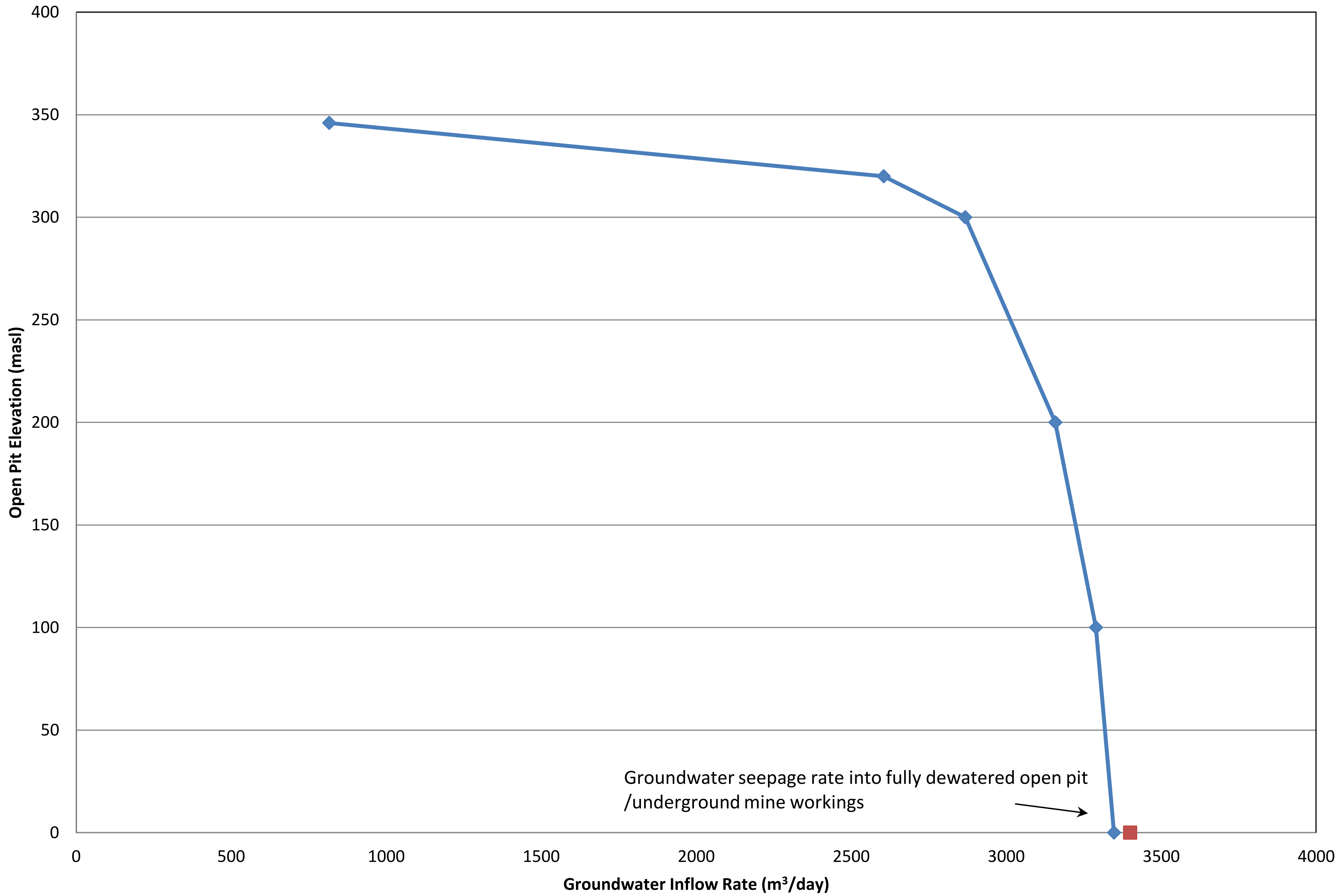
**Excludes the months of Nov, Dec, Jan, and Feb.*

Table 4: Potential Drainage Areas

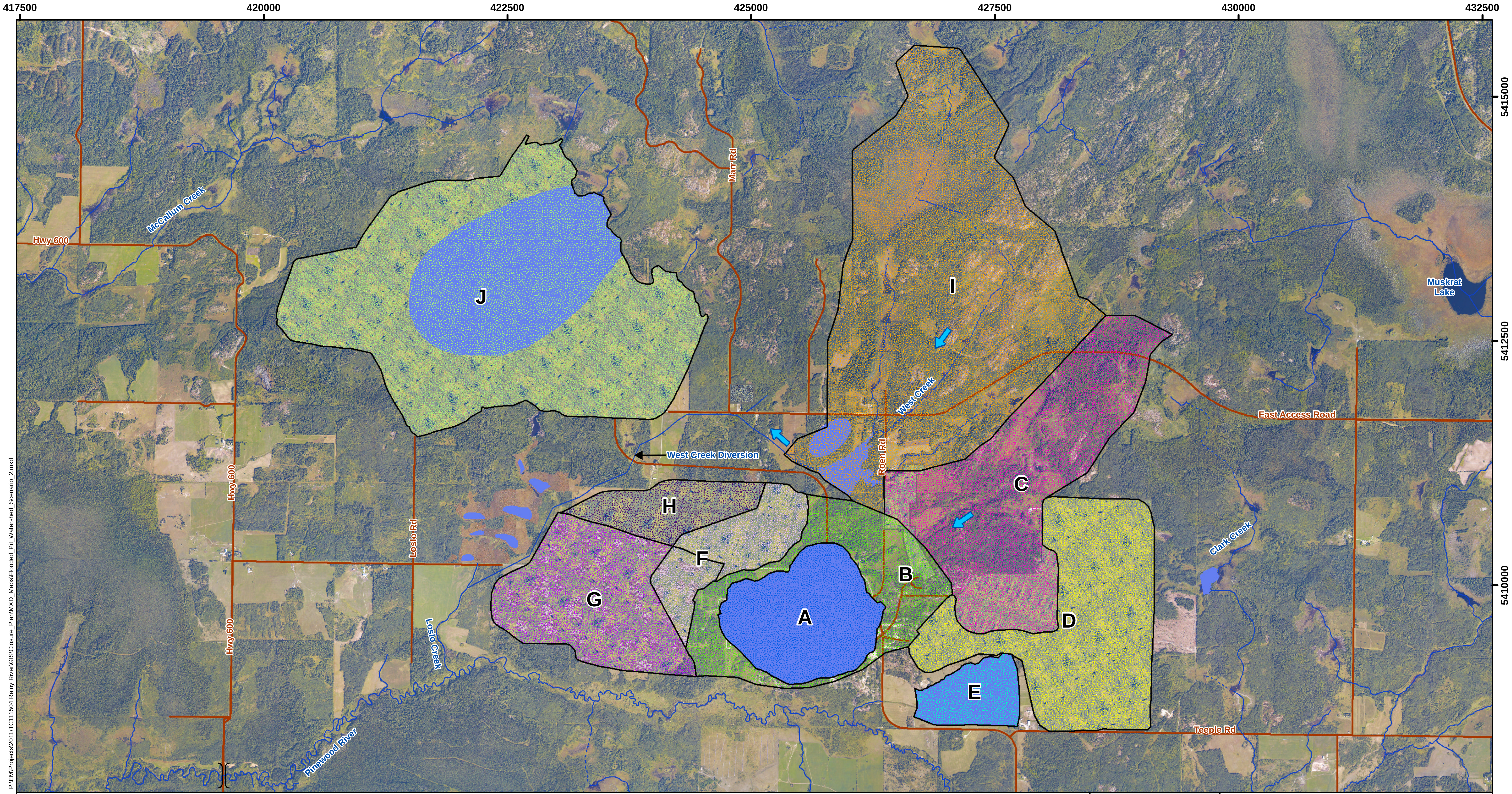
Drainage Area ID	Description:	Area (ha)	Runoff Coefficient
A	Open pit	161	90%
B	Areas surrounding open pit	261	30%
C	Stockpile pond north	351	33%
D	East mine rock stockpile	329	18%
E	Mine rock pond	101	90%
F	Stockpile divide to pit	104	45%
G	West mine rock stockpile	250	47%
H	Overburden pile	150	42%
I	West Creek diversion	808	32%
J	Tailings management area	1210	74%

Table 5: Estimate of Open Pit Flooding Time

Scenario	Time to Flood Open Pit to Bedrock-Overburden Interface (years)	Time to Flood Open Pit to Ground Surface (years)	Average Diversion of the Pinewood River Flow	Maximum Diversion of Pinewood River
1) Direct Flows	68	97	12%	12%
2) Enhanced Drainage	54	73	17%	20%
3) Maximum Diversion	21	26	44%	58%



Groundwater Inflow Rate	
Rainy River Gold Project: Estimate of Open Pit Flooding Time	
Oct-13	Figure 1



LEGEND

- Rock
- Revegetated
- Wetland
- Pond/Flooded
- Watercourses
- Roads
- Flow Direction

Flooded Pit Watersheds

A, B, C, D, E, F, G, H, I, J

ID:	Description:	ID:	Description:
A	Open pit	F	Stockpile divide to pit
B	Areas surrounding open pit	G	West mine rock stockpile
C	Stockpile pond north	H	Overburden pile
D	East mine rock stockpile	I	West Creek diversion
E	Mine rock pond	J	Tailings management area

Notes:
- Aerial imagery provided by RRR scene date is summer 2011
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.

0 0.5 1 2 3 4 5 Kilometres

Datum: NAD83
Projection: UTM Zone 15N

N W E S

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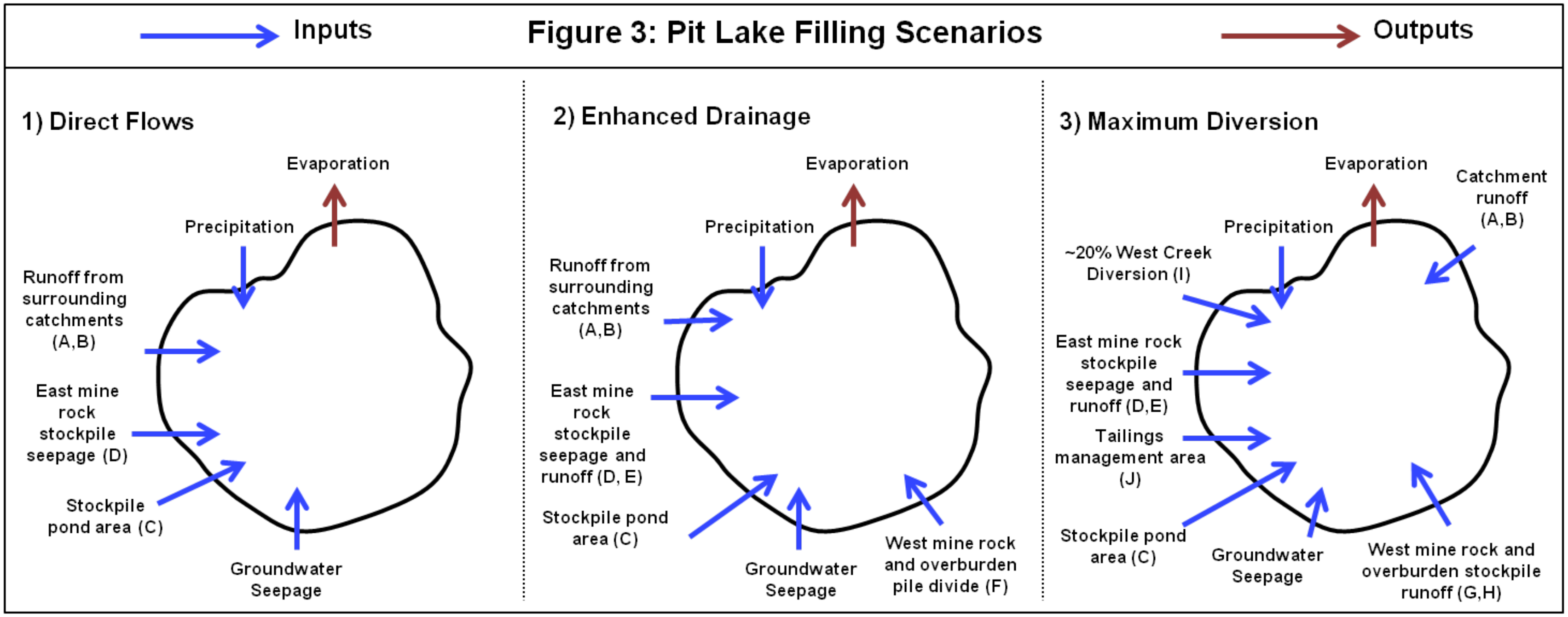
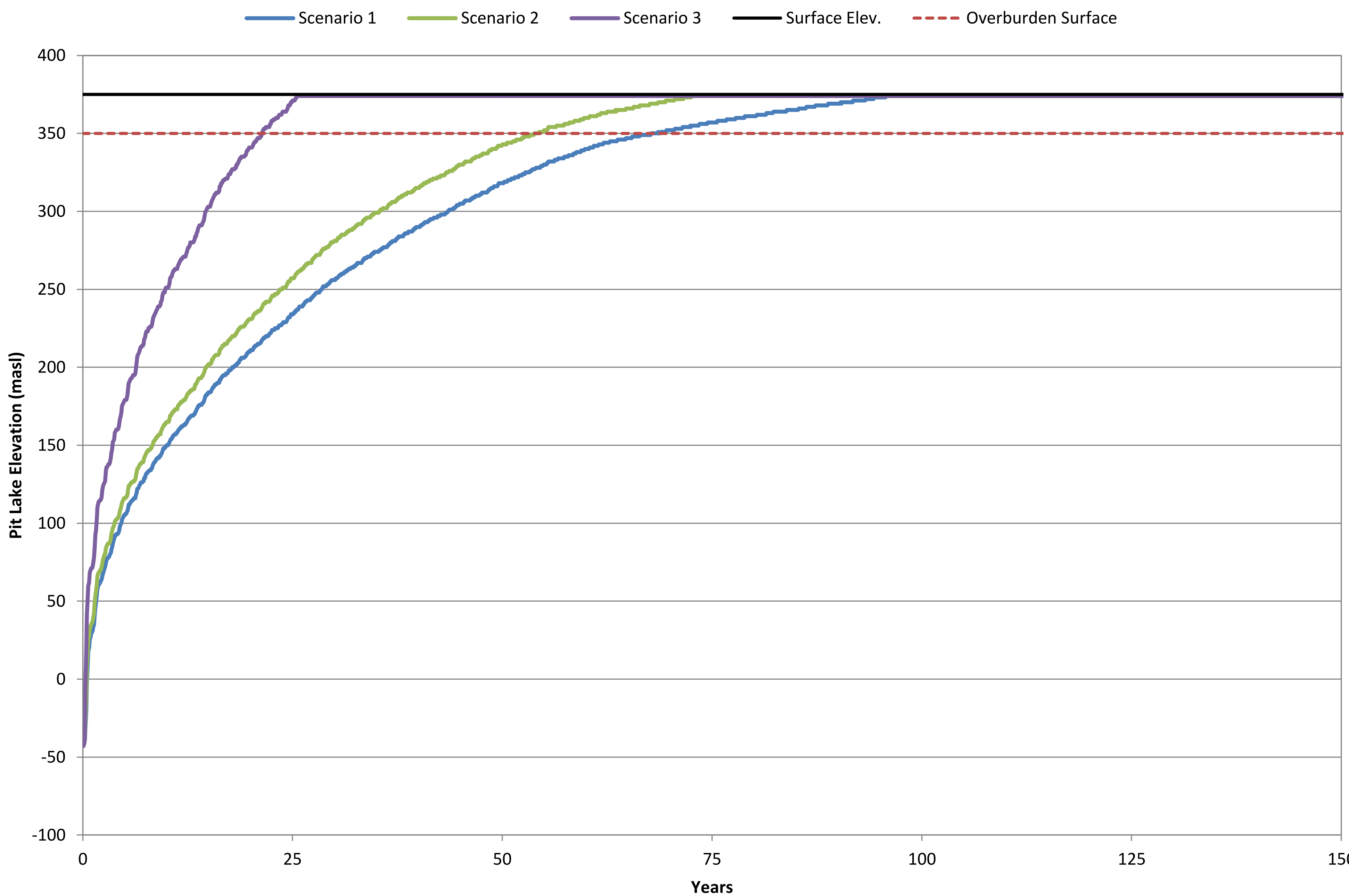
RAINY RIVER PROJECT

Schematic of Open Pit Flooding Catchments

PROJECT Nº: TC111504	**FIGURE: 2**
SCALE: 1:37,000	DATE: October 2013


Inputs
Figure 3: Pit Lake Filling Scenarios
Outputs
1) Direct Flows
Evaporation
Precipitation
Runoff from surrounding catchments (A,B)
East mine rock stockpile seepage (D)
Stockpile pond area (C)
Groundwater Seepage
2) Enhanced Drainage
Evaporation
Precipitation
Runoff from surrounding catchments (A,B)
East mine rock stockpile seepage and runoff (D, E)
Stockpile pond area (C)
Groundwater Seepage
West mine rock and overburden pile divide (F)
3) Maximum Diversion
Evaporation
Catchment runoff (A,B)
Precipitation
~20% West Creek Diversion (I)
East mine rock stockpile seepage and runoff (D,E)
Tailings management area (J)
Stockpile pond area (C)
Groundwater Seepage
West mine rock and overburden stockpile runoff (G,H)



Estimate of Open Pit Flooding Times	
Rainy River Gold Project: Estimate of Open Pit Flooding Time	
Oct-13	Figure 4