

13.0 ENVIRONMENTAL FOLLOW-UP AND MONITORING PROGRAM

13.1 Introduction

In accordance with CEAA 2012, a follow-up program (FUP) is procedural methodology for “verifying the accuracy of the environmental assessment of a designated project”, and for “determining the effectiveness of any mitigation measures”, that are implemented to mitigate the adverse effects of the project. In accordance with the EIS Guidelines, the follow-up program is to be described in “sufficient detail to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them), and to confirm both the assumptions and the effectiveness of mitigation”. The follow-up program will also include:

- Specific commitments that clearly describe how the proponent intends to implement them;
- Any contingency procedures/plans or other adaptive management provisions as a means of addressing unforeseen effects or for correcting exceedances as required to comply or to conform to benchmarks, regulatory standards or guidelines; and
- Monitor the implementation of mitigation measures resulting from Indigenous consultation.

Environmental monitoring is a key part of the follow-up program, and is one of the tools used to help verify that realized environmental effects during Project development and operation are in line with predictions made in the EIS effects analysis. Many aspects of the environmental monitoring program are expected to be prescribed in the various Provincial and Federal approvals that will be needed for mine operations.

Principal components of the Project follow-up program are the following:

- EA prediction (including an overview of follow-up program and monitoring objectives);
- Rationale for inclusion in the follow-up program;
- Proposed monitoring program (verification / assessment methods);
- Current mitigation measures;
- Criteria for considering adaptive management and potential adaptive measures;
- Applicable regulatory instruments and associated government agencies;
- Program responsibilities; and
- Reporting requirements.

At the EIS stage, the follow-up program is typically presented at a framework level of detail, recognizing that further details will be developed at a later stage, following completion of the EIS, in conjunction with the mine permitting phase. The level of detail presented at the EIS stage must,

nevertheless, be sufficient to provide confidence in the overall program, and its ability to confirm, track and respond to environmental performance.

The follow-up program for the Project is structured on a discipline basis as per the CEA Agency request. The follow-up program elements that do not lend themselves to division by discipline such as those involving tailings dam performance, health and safety, and traffic are considered separately.

The follow-up program is designed to be adaptive to account for any environmental effects that were not expected, new information that becomes available, or mitigation measures that are found to not to be effective. Therefore, the follow-up program is subject to change as the Project is further developed, and as input is received from government agencies, Indigenous groups, and stakeholders. This inclusive process will allow for all parties involved to have input into the final follow-up program.

The follow-up program provided in this section of the EIS takes into consideration input from the Round 1 information requests made by government agencies, Indigenous peoples and stakeholders, to incorporate concerns made throughout Project engagement.

13.2 Terrain and Soils

13.2.1 EA Prediction and Overview of Follow-up Program and Monitoring Objectives

The predicted effects from the Project on terrain and soils are presented in Section 6.2 of the revised EIS. The single predicted residual effect to the natural landscape is that related to potential visibility of the WRSA. Through avoidance (Section 6.2.3) and mitigation measures (Section 6.2.5), Treasury Metals is confident that the WRSA will not dramatically alter the natural landscape when viewed from Thunder Lake, the only location where modelling indicates the WRSA will be visible. Once it has been vegetated, it may be difficult to discern the WRSA from the surrounding area. To confirm this, Treasury Metals will record the viewsapes from Thunder Lake over the life of the Project to show how noticeable the WRSA is. The proposed terrain and soils follow-up program will begin once waste rock has begun being deposited in the designated WRSA, and will end in the closure phase when the WRSA will be covered and vegetated.

13.2.2 Rationale for Inclusion in the Follow-up Program

Aesthetics have been defined as a potential concern for the Project, and in particular the potential for viewscape changes to diminish the experience of being on the land, while undertaking traditional and recreational pursuits. The WRSA is expected to be developed to an approximate 25 to 30 m height above ground and will be the tallest Project related feature on the landscape.

The only point of public access where the WRSA would be visible is from Thunder Lake. Viewscape analysis indicates that with the retention of tree screens, the WRSA will not be visible from the eastern portion of the lake, but the upper part of the feature will be visible from the

western side of the lake. Other features on the site (i.e., overburden stockpile and LGO stockpile) are not expected to be visible because of their lower profiles.

13.2.3 Proposed Monitoring Program

The proposed terrain and soils monitoring will include:

- Survey the elevation of the top of the WRSA.
 - Use survey equipment to periodically record the elevation of the top of the WRSA.
- Record photographic views of the WRSA from set locations on Thunder Lake.
 - Establish set locations for recording photographic record of the WRSA (same locations as used in pre-construction visualization).
 - Annually photograph the WRSA from the set locations on Thunder Lake until the WRSA is at its maximum height, prior to vegetation of the WRSA.
 - Once the WRSA is vegetated, an annual photograph of the WRSA will be taken in the mid-summer from the set locations on Thunder Lake until the end of the closure phase.

13.2.4 Current Mitigation Measures

The following design features and procedures will be implemented as part of the Project to minimize or avoid the effects of the Project on viewscape changes to the natural terrain:

- Reduce the overall height of the constructed features to the extent possible [Mit_001];
- Construct WRSA and overburden stockpiles with an overall a 3:1 (horizontal to vertical) side slope to maintain a more natural appearance [Mit_002];
- Vegetate the western facing side of the WRSA as soon as practicable [Mit_004]; and
- The WRSA will be capped with a low permeability cover, then a layer of overburden, then vegetated during closure [Mit_018].

In addition to these measures, Treasury Metals will regularly review their procedures and processes during the life of the Project to identify opportunities where practices can be modified, and new procedures put in place to further reduce and mitigate the potential effects of the Project.

13.2.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

In the event that viewscape changes during operations are identified as problematic members of Indigenous communities and local stakeholders, Treasury Metals will consider accelerating the efforts to revegetate the western portion of the WRSA. Additionally, Treasury Metals would review the feasibility of accelerating the closure and reclamation of the WRSA, which would include the placement of a low permeability cover to isolate PAG waste rock and reduce the potential for

ARD. However, accelerated closure cannot proceed until all of the materials to be placed in the WRSA are in place.

13.2.6 Applicable Regulatory Instruments and Associated Government Agencies

There are no regulatory instruments that relate to viewsapes in this circumstance.

13.2.7 Program Responsibilities

Treasury Metals will be responsible for carrying out the follow-up program. The CEA Agency is responsible for ensuring the follow-up program is carried out.

13.2.8 Reporting

Treasury Metals intends to provide confirmation in an annual follow-up program report that the terrain and soils avoidance and mitigation measures have been implemented and are effectively minimizing aesthetic effects of the WRSA. This report will be provided to government agencies, Indigenous peoples and stakeholders. As a minimum, the annual report on the follow-up program will provide a compendium of annual photographs taken from the Thunder Lake reference locations, together with a brief summary of any previous public complaints and follow-up.

If new public complaints were received during the reporting year, regarding Project view, the annual follow-up program report would include a summary of any such public complaints, including:

- Investigation and identification of the noticeable site feature;
- Actions taken to address the complaint; and
- Actions taken to mitigate the source of the complaint, if related to the Project.

13.3 Geology and Geochemistry

13.3.1 EA Prediction and Overview of Follow-up Program and Monitoring Objectives

The predicted effects relating to geology and geochemistry are summarized in Section 6.3 of the revised EIS. A single residual adverse effect on the pit lake water quality VC was identified in the post-closure phase. There were no residual effects predicted during the site preparation and construction, operations, and closure phases. The geochemical follow-up program outlined herein provides information to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. Monitoring of the pit lake water quality as the pit lake is filling will be used to advise Treasury Metals on whether pit lake discharge into Blackwater Creek will meet PWQO, or if further treatment is required prior to the pit lake filling with water. Additionally, it is expected that a comprehensive water quality monitoring program specific to the pit lake will be required as part of the certified closure plan to be developed, filed

with MNDM prior to the start of construction. Additionally, a regulatory permitting process (i.e., Environmental Compliance Approval [ECA] under the *Environmental Protection Act* (MOECC 1990)) may be required for the releases from the pit lake, before Treasury Metals will be able to release water from the pit lake. The ECA monitoring program will be developed following the closure activities, during the period when the pit lake is filling with water. It is expected that regulatory monitoring would apply to discharges from the pit lake into Blackwater Creek Tributary 1.

Parts of this proposed geochemical monitoring program may need to be modified to reflect the requirements of the subsequent regulatory permitting process. Such changes would aim to harmonize both the regulatory monitoring requirements (i.e., the ECA process) and monitoring to confirm the EIS findings. The proposed monitoring for pit lake water quality would begin in the closure phase, once the dewatering activities cease and the open pit begins to fill with water. It is expected that monitoring of pit lake water quality would continue into the post-closure period until the regulators are satisfied the closure landscape is functioning as intended, at which time they would instruct Treasury Metals that the monitoring can cease.

As part of the process to respond to the Round 1 information requests, Treasury Metals re-evaluated the geochemistry of the rock to be mined at the Project and took a more conservative approach to the time for the onset of acidification as well as the quality of seepage likely to result from the WRSA and the TSF. In recognition of the conservative nature of the revised assessment, additional geochemical monitoring and analyses were recommended to confirm the conservative nature of the analysis presented in Section 6.3, and to better characterize the expected long-term geochemical conditions expected for the Project.

13.3.2 Rationale for Inclusion in the Follow-up Program

At mine closure, all drainage from the site, including from the TSF and the WRSA, will be routed to the open pit which will gradually fill with water to the point where a passive overflow will occur to the environment. It is important to monitor the quality of this passive overflow, and geochemical factors which could influence the quality of this outflow.

13.3.3 Proposed Monitoring Programs

Pit Lake Monitoring

- Pit lake water samples will be taken from a safe location on the ramp leading down into the pit using standard surface water sampling procedures.
- Pit lake monitoring will be conducted following the cessation of groundwater pumping until the open pit is flooded or until released from monitoring by regulatory agencies.
- Samples will be analyzed for:
 - Metals (dissolved).

- Major anions and cations.
- In-situ field parameters (temperature, reduction-oxidation potential, pH, dissolved oxygen).
- Data analysis will include long-term tracking of seasonal and annual trends, together with applicable climate and hydrological data necessary to calculate trends in loading criteria.
- Use the results of the monitoring, along with additional geochemical data collected during the life of the Project to update the pit lake model.

Pit Lake Discharge Monitoring

- Water samples will be taken from the discharge location from the pit lake into Blackwater Creek Tributary 1.
- Samples will be analyzed for:
 - Metals (total and dissolved).
 - Major anions and cations.
 - In-situ field parameters (temperature, reduction-oxidation potential, pH, dissolved oxygen).

Geochemical Monitoring

- Conduct supplemental ML/ARD static testing analysis to assess the potential influence of aged (2009 and 2010) drill core on previous ML/ARD investigations and more completely assess mercury as a contaminant of potential concern, as well as chloride and phosphorus.
- Continue operation of existing field cells (one for each lithology) and consider initiation of additional field cells using blended lithologies to simulate field conditions.
- Initiate a supplemental kinetic testing program for waste rock and tailings to address gaps in the current program.
- Explore mitigation options and possibly further studies on waste rock and tailings covers to support detailed planning and design to minimize the risk of ARD development and to lower potential water treatment costs during operations and work toward eliminating a need for water treatment in the closure and post-closure phases of the Project.
- Develop a program to identify suitable construction rock for the Project that could target previously unsampled regions of the open pits, other potentially low sulphide on-site rock or identification of an off-site source.
- Continue to update mine rock management planning for all aspects of the Project including underground operations, based on the further and continuing geochemical studies.

- Develop a pit lake model to predict pit lake water quality during the pit filling and post-closure periods, with such model to identify applicable short-term and long-term water management and treatment requirements. The pit lake model may be periodically updated as new information becomes available.

13.3.4 Current Mitigation Measures

Measures listed below will be employed as part of the Project to limit or avoid the effects on geology and geochemistry. These measures are primarily focused on controlling potentials for ML/ARD development in water that would report to the open pit.

- Waste rock will be evaluated and segregated between PAG and NAG rock, if feasible. [Mit_019].
- The PAG waste rock would be placed in the mined out areas of the open pit, to the extent practical. [Mit_020].
- During operations, tailings will be maintained in saturated conditions, and a water cover will be maintained over the majority of the TSF to prevent the onset of acidification. [Mit_021].
- The WRSA will be capped with a low permeability cover, then a layer of overburden, then vegetated during closure. [Mit_018].
- The open pit will be allowed to flood at closure [Mit_022].
- Tailings within the TSF will be isolated using either a low permeability dry cover, or a wet cover of non-process water. The preferred option for limiting environmental effects is a wet cover. [Mit_023].
- The pit lake will be monitored as it is filling to determine whether batch treatment will be required to ensure the water meets PWQO, or background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. [Mit_024].
- Once the pit lake is fully flooded, it is expected that the monitoring of the water quality in the pit lake will continue for a period of time to determine whether additional batch treatment may be required to ensure the water released from the pit lake meets effluent release limits. [Mit_124].

13.3.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

If monitoring and geochemical data indicate that the pit lake outflow is not likely to be suitably protective of Blackwater Creek, then further measures will be evaluated as to their potential to improve pit lake discharge water quality. Potentially applicable adaptive measures could include:

- Improving TSF and WRSA cover designs to better limit ML/ARD at source;

- Proactively developing the pit lake in a manner that better facilitates chemical stratification, as a means of keeping metals in a precipitated state as sulphides;
- Adjusting the pit lake water pH, using lime or other reagents to facilitate improved metals precipitation; and
- Optimizing the growth of algal and zooplankton populations, such as with periodic nutrient addition, as a means of permanently sequestering metals from the upper waters (epilimnion) of the pit lake water column.

13.3.6 Applicable Regulatory Instruments and Associated Government Agencies

Mine operations during and following closure are regulated primarily through the Ontario *Mining Act*, administered by the MNDM, wherein a proponent is required to have filed a Closure Plan accepted by the Ministry, which includes provisions ML/ARD control, final effluent quality, receiving water protection, and monitoring. An ECA could also be required from the MOECC, pursuant to the *Water Resources Act*, for managing and monitoring site effluent discharges and receiving waters.

13.3.7 Program Responsibilities

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding pit lake water management, and for implementing Closure Plan measures, and all monitoring relating to EIS commitments and to the Closure Plan, and the ECA if applicable. The CEA Agency would be responsible for ensuring that the follow-up program is carried out, and MNDM and MOECC would be responsible for ensuring that any actions on the part of the Proponent are carried out in relation to Closure Plan and ECA requirements.

13.3.8 Reporting

Treasury Metals intends to provide the pit lake water quality monitoring results as part of an annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders on an annual basis following the cessation of groundwater pumping until the open pit has filled or until released from monitoring by regulatory agencies. This will include the status of applied mitigation measures and their success. In the event that the quality of the water as the pit lake was filling with water is likely to exceed PWQO, thus indicating the potential requirement for batch treatment, the annual follow-up program report will also include the following:

- Timing and nature of any additional adaptive water management or treatment measures undertaken to improve pit lake water quality;
- Confirmation that that application of any such adaptive measures have improved pit lake water quality; and
- Any updates on pit lake modeling results.

Additionally, the regulatory surface water quality monitoring results will be provided to the applicable government agencies in regulatory reports. The format of this will be determined by those applicable government agencies prior to discharge from the pit lake into the environment.

13.4 Noise and Vibration

13.4.1 EA Prediction and Overview of Follow-up Program and Monitoring Objectives

The predicted effects of the Project on noise and vibration were presented in Section 6.4 of the revised EIS. The noise predictions show that, even with the implementation of mitigation measures presented in Section 6.4.5, there will be residual adverse effects of the Project on noise. However, the results of the conservative noise modelling indicate that residual noise levels would meet the relevant criteria established by MOECC, and thus there would likely be no directly identifiable need for noise monitoring under the regulatory approval process for noise in Ontario (i.e., an ECA under the *Environmental Protection Act*). Additionally, the predicted residual effects of noise and vibration associated with blasting activities are below the precautionary limits identifying the need for noise and vibration monitoring in NPC-119 (MOECC 1978). Therefore, no noise and vibration monitoring for blasting activities is anticipated to be needed from a regulatory perspective. That stated, it is possible that the MOECC could require Treasury Metals to implement a regulatory noise monitoring program as part of the ECA approval process for the Project.

Notwithstanding the conclusion that noise and vibration monitoring is not likely to be required from a regulatory perspective (pending the MOECC position during the pending ECA process), Treasury Metals have identified that the follow-up program for noise would be supported by three monitoring programs (Ambient Noise, Wildlife Noise, and Blasting Noise and Vibration) that will be implemented to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. Additionally, the follow-up program will provide information to help address potential complaints from members of Indigenous communities, land users and adjacent residents, should they occur.

The noise and vibration follow-up program, outlined below, would begin during the site preparation and construction phase. If blasting is not required until the operations phase, that component of the follow-up program would not start until the operations phase. Monitoring of blasting noise and vibration would cease at the end of operations, while the other monitoring would continue through the closure phase. There would be no need for noise and vibration monitoring during the post-closure phase as there would be no sources of noise at the site.

13.4.2 Rationale for Inclusion in the Follow-up program

While modeling indicates that follow-up noise and vibration is unlikely to be required in accordance with MOECC needs, Treasury Metals recognizes that concerns have been expressed during conduct of the EA regarding possible interference with the enjoyment of their properties by local residents, and the experience of being out on the land by members of Indigenous

communities. In deference to these concerns, Treasury Metals feels that it is important to carry-out monitoring as part of the follow-up program for potential noise and vibration effects.

13.4.3 Proposed Monitoring Programs

13.4.3.1 Ambient Noise

- Ambient noise monitoring at selected sensitive receptors, including at selected receptors along East Thunder Lake Road and along Tree Nursery Road.
- The frequency of ambient noise monitoring will be conducted as follows, or in accordance with Provincial approvals if applicable:
 - A summer campaign during site preparation and construction activities.
 - A summer campaign once every three years during operations.
 - A summer campaign during closure activities.
 - If complaints are received, additional campaigns may be considered, as appropriate.
- During the program, noise will be recorded in the following manner:
 - Hourly, A-weighted equivalent noise levels (L_{eq} , in dBA).
 - 72-hours of monitoring at each location.

13.4.3.2 Wildlife Noise

- A summer campaign to identify the extent of the 50 dBA noise contour to identify and confirm areas where noise could affect wildlife.
- Wildlife noise monitoring will be conducted as follows:
 - Once during site preparation and construction activities.
 - Once every three years during operations.
- Although wildlife may not respond in the same manner as humans, the available literature relies on noise thresholds based on A-weighted measurements. During the program, noise will be recorded in the following manner:
 - Hourly, A-weighted equivalent noise levels (L_{eq} , in dBA); and
 - A series measurements at varying distance and locations around, and outside the operations area that will be used to develop a spatial distribution of 1-hour equivalent noise readings.

13.4.3.3 Blasting Noise and Vibration

- Noise and vibration monitoring during blasting at selected sensitive receptors along East Thunder Lake Road.
- Blasting noise and vibration monitoring will be conducted as follows:
 - A campaign during operations when open pit mining activities are in pit 1 (western most pit) and relatively close to the surface.
 - If complaints are received, additional campaigns may be considered, as appropriate.
- During the program, noise will be recorded in the following manner:
 - Peak sound pressure (in dBA).
 - Peak particle velocity (cm/s).

13.4.4 Current Mitigation Measures

The Project will employ best practices that will help reduce and mitigate noise effects, including the following:

- Implement a modern blasting program that minimizes the blast area, the overall amount of explosives required, and through detonating procedures, minimize the amount of explosives per delay. [Mit_029].
- Adjust blasting practices if effects of vibration to spawning shoals is identified [Mit_030].
- Endeavor to schedule noise causing events, such as blasting, to reduce disruption to residents. [Mit_026]
- Advise nearby residents of significant noise-causing activities, such as blasting. [Mit_027]
- Heavy equipment activity will be conducted between the hours of 07:00 and 22:00, if feasible [Mit_025].
- Material will be loaded into haul trucks in a manner that minimizes the drop height from the loader or excavator bucket to the bed of the truck [Mit_031].
- All internal combustion engines will be fitted with appropriate muffler systems [Mit_028].

13.4.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

Additional adaptive management measures would be considered if MOECC NPC-300 Guidelines are exceeded at nearby residences, (MOECC 1995), or if the 50 dBA noise threshold is consistently exceeded at areas beyond those predicted in the EIS (see Figure 6.4.6-1).

Potential adaptive management measures to further reduce noise levels include the following:

- Possible rubber bedding material currently being investigated.
- Employing white noise backup alarms for surface equipment to reduce the tonal noise compared to traditional backup alarms. It should be noted that backup alarms are not included in the noise that is regulated in Ontario due to their importance for ensuring worker health and safety.
- In the event that complaints lead to the identification of specific sources of concern, source-specific abatement such as noise walls, berms, or operational restrictions will be employed, as appropriate. [Mit_033].

13.4.6 Applicable Regulatory Instruments and Associated Government Agencies

If the MOECC determines that noise and/or vibration monitoring is required, such requirements will be specified in the ECA for air and noise. Otherwise there are no regulatory instruments that relate to noise and vibration follow-up, and the CEA Agency would be responsible for ensuring the follow-up program related to noise and vibration is carried out.

13.4.7 Program Responsibilities

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding noise and vibration follow-up, and the ECA Agency would be responsible for ensuring that the follow-up program is carried out. MOECC would be responsible for ensuring that any monitoring requirements defined in ECA for air and noise are carried out by the Proponent.

13.4.8 Reporting

Treasury Metals intends to provide the noise and vibration monitoring results (ambient noise, wildlife noise, blasting noise and vibration) as part of the annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders. In addition, a summary of noise complaints received by Treasury Metals, if any, will also be documented along with steps taken to confirm the reason and or validity of the complaint. For valid complaints, the annual follow-up program report will include the following:

- Results of the investigation to identify the cause of the elevated noise levels;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the elevated noises, if associated with the Project; and
- Confirmation that the remedial actions were successful in addressing the issues.

If no specific noise or vibration monitoring was completed during a particular year, the Annual Follow-up program report would provide a brief summary of results from the preceding year when

monitoring was completed. If noise and vibration monitoring are required as part of an ECA issued by the MOECC, these results would be reported as per conditions in the ECA.

13.5 Light

13.5.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives

The predicted light effects from the Project are presented in Section 6.5. The light intrusion modelling determined that with the avoidance (Section 6.4.3) and mitigation (Section 6.4.5) measures, light trespass from the Project would not exceed 0 lux outside the operations area during all phases of the Project.

Currently there are no regulatory frameworks that would apply for light and light trespass, therefore, it is not expected there would be any regulatory monitoring requirements for monitoring light.

Treasury Metals has identified a focused light follow-up program that will be implemented to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. As there will be no permanent lighting during the site preparation and construction phases, the program would not start until operations, when the processing facility and associated infrastructure are fully developed. There will be no permanent lighting sources during the closure and post-closure phases, so there would be no monitoring after operations stop.

13.5.2 Rationale for Inclusion in the Follow-up Program

Light trespass caused by artificial lighting can be regarded as a nuisance by adjacent property owners and residents, and has the potential to interfere with the behaviour of some species of wildlife, either positively or negatively.

13.5.3 Proposed Monitoring Program

Light Trespass

- Following the commissioning of the process plant and associated infrastructure, the configuration of the lighting will be used to confirm the lighting system was installed with consideration for the effects avoidance (Section 6.5.3) and mitigation (Section 6.5.5) measures relied on in the assessment. This is to be completed once, following the initial installation of the light system.
- A focused monitoring campaign to record light trespass levels associated with the commissioned process plant will be conducted once following the completion of major site building infrastructure (i.e. process plant).

- Document complaints from local residents regarding light trespass from the Project and determine the source of the trespass.

13.5.4 Current Mitigation Measures

The following elements built into the design of the lighting layout and the configuration of the Project will help avoid potential effects of the Project on light:

- Activities during the site preparation and construction phase will generally occur during the daytime. If there are times when lighting is required to ensure the safety of the workers, portable lighting will be used in required areas only. [Mit_034].
- Portable lighting will be directed downward. [Mit_035].
- The higher Lux illumination levels (>80) will be placed within the process plant and mine infrastructure buildings, which contains the process and electrical equipment. [Mit_036].
- All externally mounted luminaires and their associated lamps will be designed to meet the requirements and recommendations of the Canadian Electrical Code (CEC), and the Building Code of Ontario. [Mit_037].
- External light fixtures will be installed at a tilt angle of 45°. [Mit_038].
- Cut off angles for external lightings will be designed to minimize the off-site light trespass. [Mit_039].
- Nighttime illumination will not be provided at the tailings storage facility (TSF). [Mit_040].
- Nighttime illumination will only be provided in the open pit when required. Portable lighting will be used in these situations. [Mit_041].
- Activities during the closure phase will generally occur during the daytime. If there are times when lighting is required to ensure the safety of the workers, portable lighting will be used in required areas only. [Mit_042].

13.5.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

No measurable threshold criteria are proposed in relation to lighting. However, if complaints regarding Project area lighting are received from local residents or land users, the merits of the complaints will be considered, within the context of the nature of the complaint, and the need to ensure safe working conditions at the site.

Potential adaptive measures could include:

- Adjustments to lighting arrangements or angles; and
- Changes to lighting intensity.

13.5.6 Applicable Regulatory Instruments and Associated Government Agencies

There are no regulatory instruments that relate to lighting in this circumstance.

13.5.7 Program Responsibilities

Treasury Metals will be responsible for carrying out the follow-up program. The CEA Agency is responsible for ensuring the follow-up program is carried out.

13.5.8 Reporting

Treasury Metals intends to provide confirmation in the annual follow-up program reports following the year that the light avoidance and mitigation measures have been implemented. Additionally, the annual follow-up program report would provide a brief summary of any public complaints regarding light intrusion. This report will be provided annually to government agencies, Indigenous peoples and stakeholders.

13.6 Air Quality

13.6.1 EA Prediction and Overview of Follow-up Program and Monitoring Objectives

The predicted effects of the Project on air quality, taking into account the avoidance measures incorporated into the Project (Section 6.6.3), are presented in Section 6.6.4. With the consideration of air mitigation measures (Section 6.6.5), residual adverse air quality effects are predicted to remain (Section 6.6.6). These effects would be most notable in the vicinity of the operations area, but will extend into areas where traditional uses of the land could occur, and could extend beyond the property line.

Although there were predicted residual adverse effects on ambient air quality, it was also demonstrated that the Project would be able to achieve compliance with the O.Reg 419/05 point of impingement criteria at the property boundary, which would be required in order to support the regulatory permitting process to obtain an ECA under the EPA in Ontario (see Appendix J-3). Although compliance is demonstrated, regulatory air monitoring requirements could be required by the MOECC as part of the Provincial permitting process. The details of a regulatory monitoring program, would therefore be developed as part of the permitting process. This process would also include the development of a Best Management Practices Plan for Dust (a draft Best Management Practices Plan for Dust is provided in Appendix J-4).

Notwithstanding the potential regulatory monitoring requirements, Treasury Metals has identified an air quality follow-up program as part of the EIS that will be implemented to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. The follow-up program will include a monitoring component that will provide information to help address potential complaints from adjacent residents, should they occur. This proposed

EIS air quality monitoring program outlined in the following section is subject to change pending input from the MOECC during the permitting process.

The proposed air quality Follow-up program will begin prior to site preparation and construction and would cease once heavy equipment operations cease in the closure phase.

13.6.2 Rationale for Inclusion in the Follow-up Program

Air quality is an important component of the environment, and while nuisance dust is a primary concern, a number of the air quality standards which are applicable to the Project are health-based. Consistency with Ontario air quality standards is therefore a key Project environmental objective. Having said this, much of the dust associated with mining projects is from blasting and from haul truck use along haul roads. The Goliath Gold Project is a comparatively small scale operation with a very compact site, with corresponding short haul roads. The potential for exceeding air quality standards is therefore very low.

13.6.3 Proposed Monitoring Program

Air quality monitoring will be conducted in the following manner:

- A continuous air monitoring station will be installed near the security gate, south of the Project, and to the west of Normans Road.
 - The station will include analyzers to measure the following: total suspended particulate matter (TSP); particulate matter nominally smaller than 10 μm (PM_{10}); particulate matter nominally smaller than 2.5 μm ($\text{PM}_{2.5}$); and nitrogen dioxide (NO_2).
 - The analyzers will be capable of recording the concentrations over the following time periods: TSP – 24-hour and annual; PM_{10} – 24-hour; $\text{PM}_{2.5}$ – 24-hour; NO_2 – 1-hour and 24-hour.
- Passive sampling of NO_2 and SO_2 to the west of the Project on Thunder Lake Rd. and to the south of the Project at Anderson Rd. These samplers would monitor average concentrations over 30-day periods through the year.
- Particulate matter will be collected passively over a 30-day period using dust fall jars. These collected samples will be submitted for analysis of total dustfall, as well as for the metals content within the collected particulates.
- A meteorological station will be installed in the operations area to record continuous meteorological data. This data will be used in conjunction with the air quality data to determine trends, and will provide support information for ongoing Project engineering.
- Treasury Metals will record any complaints received regarding air quality associated with the Project.

13.6.4 Current Mitigation Measures

The Project will employ best practices that will help reduce and mitigate air quality effects, including the following:

- Implement a modern blasting program that minimizes the blast area, the overall amount of explosives required, and through detonating procedures, minimize the amount of explosives per delay. [Mit_029].
- Blasting will likely be restricted to once per day, and only a few days per week. [Mit_043].
- Material will be loaded into haul trucks in a manner that minimizes the drop height from the loader or excavator bucket to the bed of the truck [Mit_031].
- All internal combustion engines will be properly maintained and all emission control systems (e.g., diesel particulate filters) will be kept in good working order. [Mit_044].
- Water and chemical suppressants will be used for dust control on the haul roads at the mine site when temperatures are above freezing. [Mit_045].
- Best management practices plan for dust control will be implemented on the site during site preparation and construction, operations and closure. [Mit_046].

13.6.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

If monitoring shows that sites operations are not in compliance with the O.Reg 419/05 point of impingement criteria at the property boundary, or if nuisance dust is perceived to be of greater concern than predicted, additional mitigation measures will be implemented to better control air emissions. These measures will likely focus on improved measures for dust control, if and as required.

13.6.6 Applicable Regulatory Instruments and Associated Government Agencies

Air emissions from mining operations are regulated through the ECA for air and noise, issued by the MOECC.

13.6.7 Program Responsibilities

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding air quality monitoring. The ECA Agency would be responsible for ensuring that the Follow-up program is carried out. MOECC would be responsible for ensuring that any monitoring requirements defined in ECA for air quality are carried out by the Proponent.

13.6.8 Reporting

Treasury Metals intends to provide a summary of the air quality monitoring results for all the measured parameters as part of the annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders on an annual basis. The annual follow-up program report would also summarize any public complaints regarding air quality, including:

- Investigation and identification of the sources of emission;
- Actions taken to address the complaint;
- Actions taken to mitigate the source of the complaint, if related to the Project; and
- Summary of annual air quality complaints.

13.7 Climate

13.7.1 EA Prediction and Overview of Follow-up Program and Monitoring Objectives

The predicted effects of the Project on climate were presented in Section 6.7, and it was identified that the expected total GHG emissions from the Project during the site preparation and construction phase, the operations phase, and the closure phase, will exceed the 10,000 t/year, based primarily on fuel consumption for the Project. The emissions from stationary sources would be restricted to the natural gas heating required when mining underground. The total GHG emissions for the Project exceed the regulatory reporting threshold outlined in Section 46 of the *Canadian Environmental Protection Act*, which includes emissions from mobile and stationary sources. However, the Project does not meet the Provincial regulatory reporting requirements for the Ontario Cap and Trade Program Regulation 144/16, which also has a 10,000 t/year reporting threshold, but which is applicable to stationary sources only. The proposed monitoring program for climate is consistent with the regulatory reporting requirements for GHG emissions.

13.7.2 Rationale for Inclusion in the Follow-up Program

Climate change is a high priority for both the Federal and Provincial governments, both of which have committed to the tracking and long-term reduction of GHGs.

13.7.3 Proposed Monitoring Program

The climate monitoring program would focus on the requirements under Section 46 of the *Canadian Environmental Protection Act*, and would include:

- Record the annual fuel usage, as described in the Greenhouse Gas Management Plan (Section 12.8); and

- Use the calculation stipulated in the Technical Guidance Document on Reporting Greenhouse Gas Emissions, as set out in the Greenhouse Gas Management Plan (Section 12.8) to calculate the annual Project GHG emissions.

13.7.4 Current Mitigation Measures

The following measures will be incorporated into the Project to mitigate and avoid GHG emissions:

- The Project will utilize the 115 kV transmission line adjacent to the Project. [Mit_047].
- The WRSA will be located immediately to the north of the open pit. [Mit_048].
- Placing the overburden storage area immediately to the south of the open pit to reduce the haul distances. [Mit_049].
- Project design incorporates a compact footprint. [Mit_050].
- Investigation and implementation of battery powered mining equipment where possible.

13.7.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

Treasury Metals has done everything reasonably possible to design and operate the Project in an energy efficient manner. No other potential adaptive management measures are envisioned for the Project.

13.7.6 Applicable Regulatory Instruments and Associated Government Agencies

The following two regulatory instruments would apply for the GHG emissions from the Project:

- Section 46 of the *Canadian Environmental Protection Act*, administered by the ECCC has a reporting requirement for facilities that have total GHG emissions in exceed the 10,000 t/y of equivalent CO₂. Treasury Metals would appear to meet this reporting requirement, and would therefore need to prepare and submit annual reports to ECCC.
- The Ontario Cap and Trade Program (O.Reg. 144/16) also has a reporting requirement for facilities with 10,000 t/y of equivalent CO₂ from stationary sources. Treasury Metals would fall below the reporting requirement for O.Reg. 144/16.

13.7.7 Program Responsibilities

Treasury Metals would be responsible for determining and reporting annual GHG emissions to the ECCC. The ECA Agency would be responsible for ensuring that the Follow-up program is carried out.

13.7.8 Reporting

As a regulatory requirement under of Section 46 of the *Canadian Environmental Protection Act*, Treasury Metals will report the findings of the GHG emissions calculation on an annual basis to the ECCC. In addition, Treasury Metals intends to provide the GHG calculation results as part of the annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders.

13.8 Surface Water Quality

13.8.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives

The predicted effects to surface water quality from the Project are summarized in Section 6.8.4 of the revised EIS. Even with the avoidance measures described in Section 6.8.3, and mitigation measures outlined in Section 6.8.5, residual adverse effects from the Project on surface water quality will remain. However, the water quality modelling has determined that the resulting water quality in the receiving environment will be equivalent to existing conditions, or will meet PWQO. The proposed surface water quality follow-up program will help confirm the findings of the EIS and confirm the effectiveness of the mitigation measures. The proposed EIS mentoring program is described in Section 13.8.3).

In addition to the EIS monitoring, it is expected there will be a comprehensive regulatory surface water quality monitoring program developed in cooperation with government agencies, as part of the Project permitting process (under the ECA process governed by the MOECC and under Schedule 5, Part 1 of the MMER). This regulatory program would include requirements for monitoring effluent and water quality of the receiving waterbodies. These monitoring programs will incorporate all surface water quality monitoring that will be required during the life of the Project from a regulatory perspective. The surface water monitoring program outlined below in Section 13.8.3 as a part of the EA process is subject to change upon finalization of the regulatory monitoring program designated by applicable government agencies to allow for a single, harmonized monitoring program that encompasses all surface water quality monitoring.

For consistency with the available data, and the assessment of effects, the proposed program would use receiving water stations used during the baseline monitoring (Figure 13.8.2-1). The focus of the program will be on those watercourses where potential effects to surface water quality could be seen as a result of the Project. The surface water quality monitoring program, developed for the EIS, will begin prior to the site preparation and construction phase of the Project, and will cease once Treasury Metals is released from monitoring by regulatory agencies.

13.8.2 Rationale

Local Indigenous community members and other area residents have continually expressed that water quality protection is the most critical environmental aspect relating to the Project. Wabigoon Lake, in particular, which will ultimately receive treated effluent via Blackwater Creek, is a large

system which is critical to a number of resource users including members from several Indigenous communities.

13.8.3 Proposed Monitoring Program

A total of 12 proposed monitoring locations shown in Figure 13.8.3-1 will be used in the monitoring to support the follow-up program. These locations correspond to the locations used to collect baseline results. Treasury Metals intends to carry these locations forward for their surface water quality monitoring program. Each sample location will be analyzed for relevant parameter suites, as per Table 13.8.3-1:

Table 13.8.3-1: Summary of Surface Water Quality Follow-up Programs

Sampling Location	Parameter Group					
	Group A ⁽¹⁾	Group B ⁽²⁾	Group C ⁽³⁾	Group D ⁽⁴⁾	Group E ⁽⁵⁾	Group F ⁽⁶⁾
SW-TL1A, SW-JCT, SW-2, SW TL3, SW-4, SW-7, SW-8, SW-9	Monthly	Monthly	Monthly	—	—	—
SW-10, SW-11	Monthly	Monthly	—	—	—	—
SW-5, SW-6	Annually	Annually	Annually	—	—	—
Effluent Discharge	—	Monthly	—	Thrice Weekly	Weekly	Monthly

Notes:

- (1) Group A: pH, acidity, alkalinity, dissolved oxygen, chloride, conductivity, dissolved and total organic carbon, hardness, nitrate, nitrite, phosphate, sulphate, temperature (field), total and un-ionized ammonia, total dissolved solids, total suspended solids, turbidity.
- (2) Group B: Total ICP metals scan.
- (3) Group C: free cyanide, total cyanide, weak acid dissociable cyanide.
- (4) Group D: pH, total cyanide, total suspended solids
- (5) Group E: copper, lead, nickel, zinc, arsenic
- (6) Group F: Acute toxicity testing (Rainbow Trout and *Daphnia magna*)

In-situ field parameters (temperature, reduction-oxidation potential, pH, dissolved oxygen) will also be sampled for receiving water stations.

In addition to the above monitoring program, it is recognized that there will be a specific requirement to monitor the effluent discharged from the Project as part of the regulatory monitoring program to support the Provincial permitting process (i.e., an ECA under the EPA). The specific details for the effluent monitoring component will be confirmed in consultation with the MOECC, Indigenous communities, and other stakeholders.

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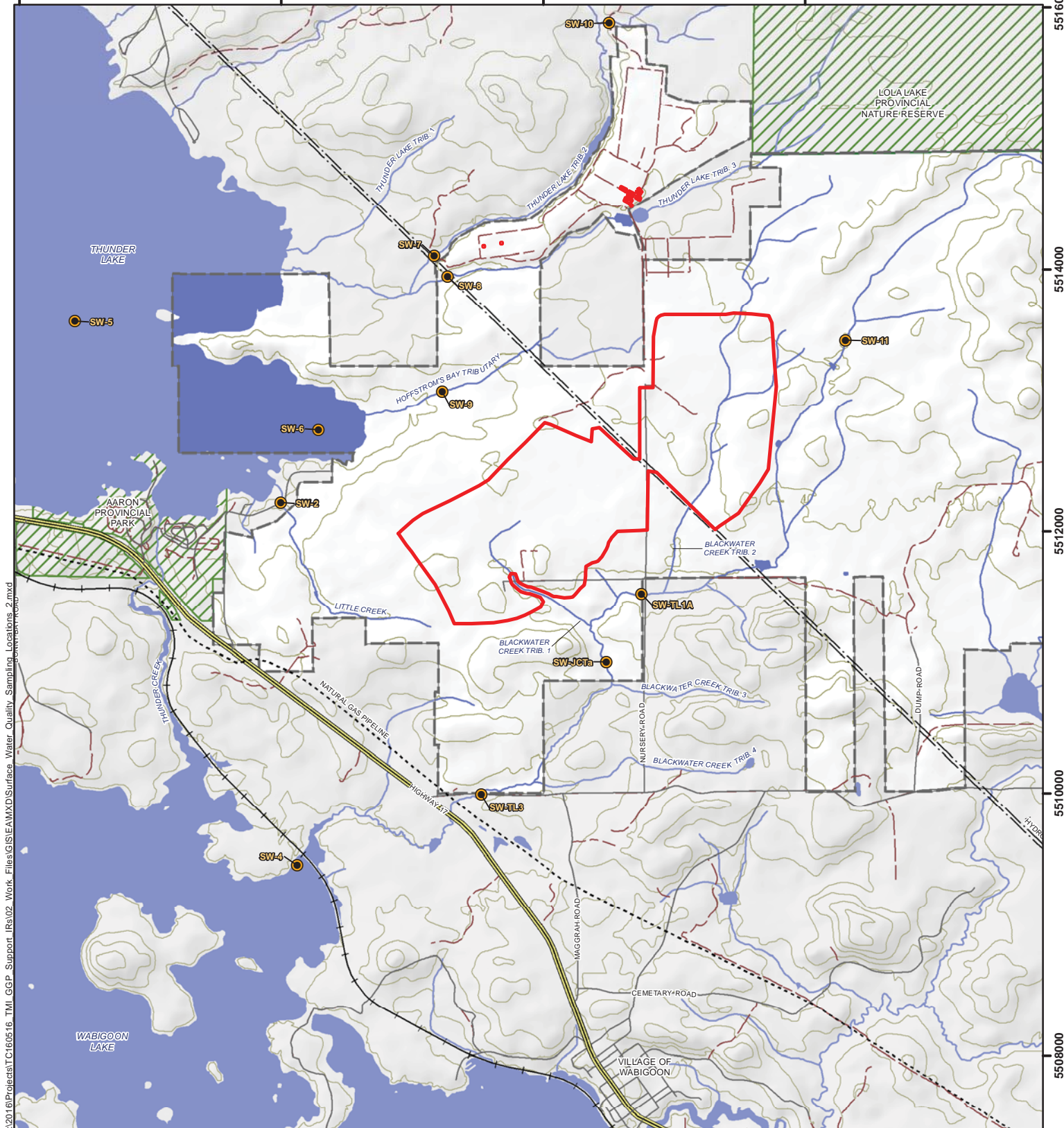
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LEGEND

- Surface Water Quality Sampling Locations
- Operations Area
- Railway
- Hydro Line
- Natural Gas Pipeline
- Highway
- Local Street
- Resource / Recreation Trail
- Provincial Park
- Watercourse
- Waterbody
- Contours (10 m interval)
- Property Boundary of Claims and Dispositions
- Area Beyond Property Boundary

NOTES:

- Topographic data extracted from Land Information Ontario (LIO), MNRF.
- Watercourses represent pre-development conditions based on LIO database, as modified by KBM.



GOLIATH GOLD PROJECT

Surface Water Quality Sampling Locations

Datum: NAD83
Projection: UTM Zone 15N



PROJECT N^o: TC160516

FIGURE: 13.8.3-1

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DATE: April 2018



13.8.4 Current Mitigation Measures

The Project will employ best practices that will assist in a reduction and mitigate surface water quality effects, which are outlined below:

- Site Preparation and Construction Phase
 - Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit_008].
 - Industry standard erosion and sediment controls, such as sediment traps within ditches, will be implemented during the site preparations and construction phase. [Mit_054].
- Operations Phase
 - Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit_008].
 - Effectively manage water collected on-site using constructed storage facilities, reducing the need for fresh water withdrawals and discharges of treated water. [Mit_057].
 - Excess water not required in the process will be treated to concentrations that meet Provincial Water Quality Objectives (PWQO) or Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life, or background if background levels exceed the PWQO, prior to discharging to Blackwater Creek. In the case of mercury, effluent will be treated to meet the background concentrations in Blackwater Creek. [Mit_053].
 - The floor of the TSF will be a low-permeability layer capable of achieving seepage rates that ensure receiving surface water quality is equivalent to baseline, or meet PWQO. The liner would be comprised of natural material, or if necessary, an HDPE liner laid over a prepared basin of sand or comparable material. [Mit_062].
 - Perimeter runoff and seepage collection systems will be constructed around the TSF. [Mit_051].
 - The drawdown zone of the dewatering process will capture all seepage that bypasses the seepage collection systems and will report to the open pit. [Mit_052].
 - The process will employ a thickener to help recover cyanide solution from the tailings for reuse in processing. The resulting tailings will then be treated using the SO₂-air process to reduce cyanide in the tailings directed to the TSF so as to meet MMER requirements over a long-term basis. [Mit_061].

- Closure Phase
 - During closure, the site will be graded such that runoff from the operations area will be directed to the open pit during closure and post-closure phases. [Mit_056].
 - The pit lake will be monitored as it is filling to determine whether batch treatment will be required to ensure the water meets PWQO, or background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. [Mit_024].
 - The drawdown zone of the dewatering process will capture all seepage that bypasses the seepage collection systems and will report to the open pit. [Mit_052].
 - There will be no discharges to surface water during the closure phase. [Mit_055].
- Post-closure Phase
 - Tailings within the TSF will be isolated using either a low permeability dry cover, or a wet cover of non-process water. The preferred option for limiting environmental effects is a wet cover. [Mit_023].
 - The pit lake will be monitored as it is filling to determine whether batch treatment will be required to ensure the water meets PWQO, or background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. [Mit_024].
 - Once the pit lake is fully flooded, it is expected that the monitoring of the water quality in the pit lake will continue for a period of time to determine whether additional batch treatment may be required to ensure the water released from the pit lake meets effluent release limits. [Mit_124].

13.8.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

A commitment has been made to treat effluent release from the site to Provincial Water Quality Objectives (PWQO) or background concentrations if background levels are above the PWQO. Where there is no PWQO for a parameter, the commitment will be to meet the Canadian Water Quality Guidelines (CWQG). For total mercury, the commitment will be that effluent discharged to Blackwater Creek will meet background concentrations for that watercourse. If monitoring data should indicate that this commitment is not being fulfilled, Treasury Metals would review and implement further treatment measures and/or optimizations to achieve this commitment. It should be noted in this context that Treasury Metals are proposing the use of in-plant cyanide destruction prior to discharge to the TSF, and the use of reverse osmosis for final effluent treatment prior to discharge to Blackwater Creek.

13.8.6 Applicable Regulatory Instruments and Associated Government Agencies

Mine effluent discharges in Ontario are governed by the *Ontario Water Resources Act* and its associated O. Reg. 560/94, administered by the MOECC, and by the MMR administered by

ECCC. Stricter final effluent and receiving water monitoring requirements, however, are expected to be set in the Provincial ECA which will reflect the commitment herein to achieving a final effluent which is consistent with PWQO values.

13.8.7 Program Responsibilities

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding surface water monitoring, including actions required under the Provincial ECA and the Federal MMER. The ECA Agency would be responsible for ensuring that the Follow-up program is carried out. MOECC would be responsible for ensuring that any monitoring requirements defined in ECA are carried out by the Proponent.

13.8.8 Reporting

It is anticipated that a regulatory surface water quality monitoring program will be developed during the ECA process and other permitting applications, which will stipulate regulatory reporting requirements. These surface water quality monitoring results will be reported to the applicable government agencies at the predetermined reporting frequency. Reporting is required pursuant to the MMER.

Additionally, Treasury Metals intends to provide the surface water quality monitoring results as part of the annual follow-up program report provided to government agencies, members of Indigenous communities and stakeholders. For any surface water quality monitoring that exceeded the management triggers (see Section 12.3), the annual follow-up program report will include the following:

- Results of the investigation to identify the cause of the elevated readings;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the elevated readings, if associated with the Project; and
- Confirmation that the remedial actions were successful in addressing the identified issues.

13.9 Surface Water Quantity

13.9.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives

The predicted effects of the Project on surface water quantity are summarized in Section 6.9.4 of the revised EIS. The predictions show that even with the mitigation measures outlined in Section 6.9.5, there will be residual adverse effects to surface water quantity during the operations phase, and through into post-closure. As the Project will need to obtain permits to take water as part of the mine dewatering activities, as well as for fresh water withdrawals, it is also likely that some form of regulatory monitoring to confirm surface flow patterns will be required.

The proposed surface water quantity follow-up program is designed to validate the predicted effects in the EIS, and confirm the effectiveness of the mitigation measures. To do this, the watercourses potentially affected by the Project will be included in flow monitoring. This program will utilize the monitoring locations previously used to establish baseline surface water quantities (see Figure 13.9.1-1), and correspond with the effects predictions, to allow for a more efficient follow-up and monitoring program. Monitoring will begin prior to site preparation and construction and will continue into post-closure. It is likely the monitoring post-closure will be continued until the regulators are satisfied that the closure landscape is functioning as planned, and Treasury Metals can discontinue monitoring. Treasury Metals will determine what equipment will be used to measure flow rates in the watercourses closer the commencement of monitoring to ensure that industry standard equipment is used.

13.9.2 Rationale for Inclusion in the Follow-up program

Facility development has the potential to alter flows in the creeks in the Project vicinity. The potential changes in flow could represent increases or decreases from the current conditions depending on the location, climatic conditions and time of year. These creeks provide habitat for aquatic life, such that meaningful alterations to system flows could affect the availability of aquatic habitat utilized by aquatic life.

13.9.3 Proposed Monitoring Program

Blackwater Creek

The following monitoring of Blackwater Creek is proposed to support the follow-up program:

- Discrete flow monitoring would be conducted upstream (SW-TL1a) and downstream (SW_JCTa) of the proposed discharge point in Blackwater Creek (see Figure 13.9.1-1);
- Periodic (at least annual) inspection of the Blackwater Creek system for any evidence of undue erosion related to Project discharges, with satellite imagery of the downstream portion of the creek to be obtained once every three years; and
- Volume of effluent discharged into Blackwater Creek on a daily basis, per O.Reg 560/90, 561/94, Clean Water Regulation.

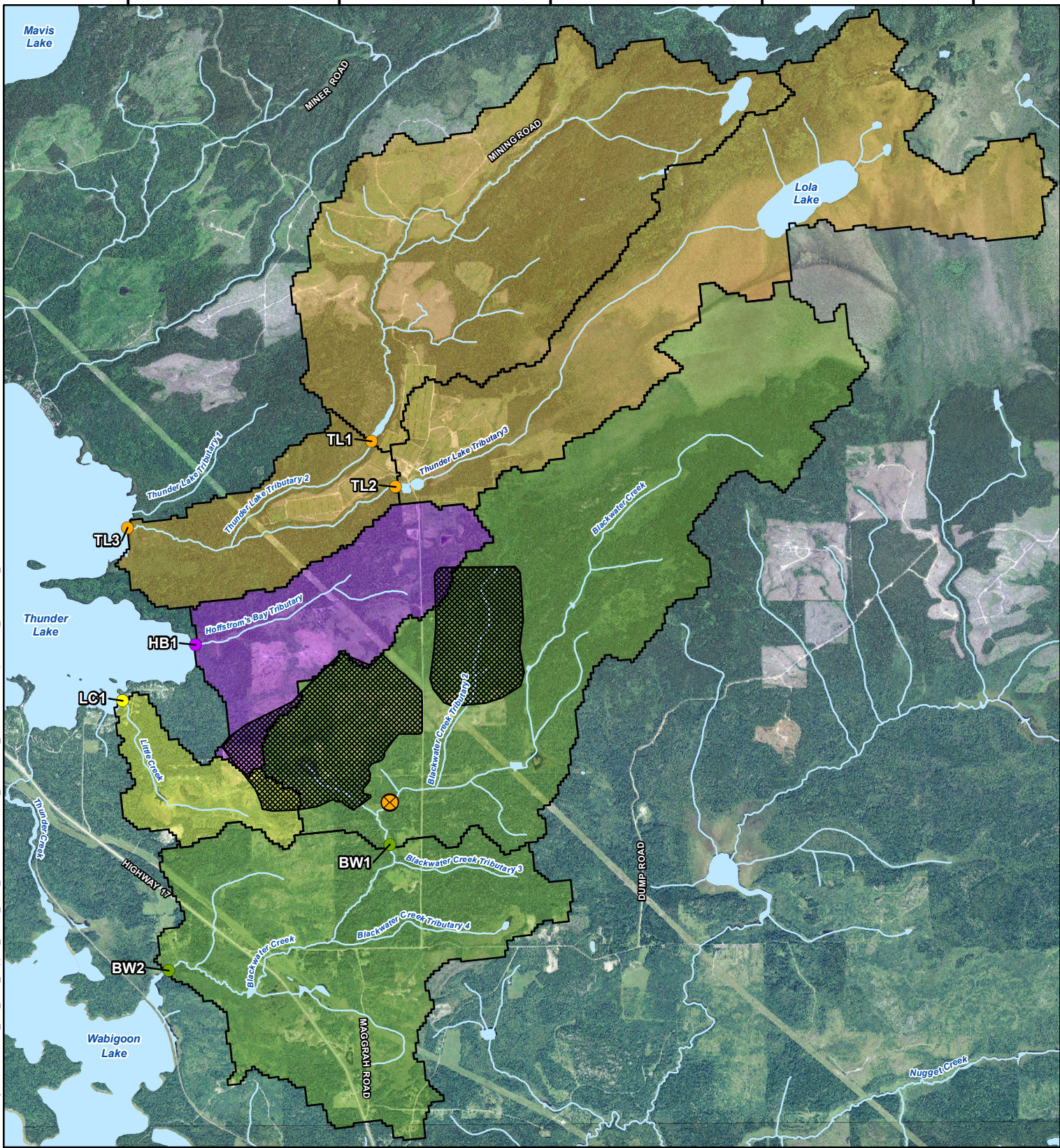
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LEGEND

- | | |
|--|--|
|  Operations Area |  Effluent Discharge Location |
| Sub-Watershed Outlet Locations | Sub-Watershed |
|  Blackwater Creek |  Blackwater Creek |
|  Hoffstrom's Bay Tributary |  Hoffstrom's Bay Tributary |
|  Little Creek |  Little Creek |
|  Thunder Lake Tributary 2 |  Thunder Lake Tributary 2 and 3 |

NOTES:
 - Topographic data extracted from Land Information Ontario, MNRF.
 - Imagery extracted from Agriculture Information Atlas, OMAFRA.



GOLIATH GOLD PROJECT

Proposed Surface Water Flow Monitoring Locations

Datum: NAD83
 Projection: UTM Zone 15N

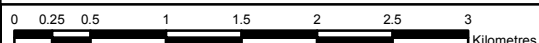


PROJECT N^o: TC160516

FIGURE: 13.9.1-1

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Thunder Lake Tributaries 2 and 3

The following monitoring of Thunder Lake Tributaries 2 and 3 is proposed to support the follow-up program:

- Two discrete flow measurement stations downstream of the Project area, one on Thunder Lake Tributary 2 (SW-7) and one on Thunder Lake Tributary 3 (SW-8), as shown on Figure 13.9.1-1.
- In addition, continuous flows will be recorded as water flows into the irrigation ponds on Thunder Lake Tributaries 2 and 3. These readings will be used to demonstrate that the withdrawals from the irrigation ponds were in accordance with the committed upper bound of 5% of the inflow.

Little Creek and Hoffstrom's Bay Tributary

The following monitoring of Little Creek and Hoffstrom's Bay Tributary is proposed to support the follow-up program:

- Flow readings will be taken periodically in both Little Creek (SW-2) and Hoffstrom's Bay Tributary (SW-9), shown on Figure 12.8.2-1.

13.9.4 Current Mitigation Measures

The Project will employ best practices that will assist in a reduction and mitigate surface water quantity effects, which are outlined below for each of the four Project phases.

- Site Preparation and Construction Phase
 - Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit_008].
 - Industry standard erosion and sediment controls, such as sediment traps within ditches, will be implemented during the site preparations and construction phase. [Mit_054].
 - Prior to overburden removal, any beaver dams within the Project footprint will be removed and the impoundments will be allowed to draw down. [Mit_077].
 - Prior to construction activities, Treasury Metals will engage with the local trapping council, Indigenous communities and the MNRF to prepare a plan for the removal of nuisance wildlife (i.e., beaver) within the Blackwater Creek watershed. [Mit_126].

- Operations Phase
 - Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit_008].
 - The operations area will be minimized to the extent possible to reduce the amount of runoff re-directed from the Little Creek and Hoffstrom's Bay watersheds. [Mit_050].
 - Effectively manage water collected on-site using constructed storage facilities, reducing the need for fresh water withdrawals and discharges of treated water. [Mit_057].
 - Prior to overburden removal, any beaver dams within the Project footprint will be removed and the impoundments will be allowed to draw down. [Mit_077].
 - Prior to construction activities, Treasury Metals will engage with the local trapping council, Indigenous communities and the MNR to prepare a plan for the removal of nuisance wildlife (i.e., beaver) within the Blackwater Creek watershed. [Mit_126].
 - An engineered structure, designed to dissipate flows and avoid erosion, will be constructed to discharge effluent during operations into Blackwater Creek. [Mit_058].
 - Fresh water takings from tree nursery irrigation ponds on Thunder Lake Tributaries 2 and 3 will not exceed 5% of the flow entering the ponds. [Mit_059].
- Closure Phase
 - Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit_008].
 - There will be no discharges to surface water during the closure phase. [Mit_055].
- Post-closure Phase
 - During closure, the site will be graded such that runoff from the operations area will be directed to the open pit during closure and post-closure phases. [Mit_056].
 - Once the open pit has been filled, excess water from the open pit will be passively released through an engineered spillway into the existing channel of Blackwater Creek Tributary 1. [Mit_060].

13.9.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

In the event that water quality monitoring identifies enhanced erosion (e.g., TSS levels downstream of the effluent discharge are statistically higher than the upstream readings) Treasury Metals would implement additional mitigation measures that could include:

- reducing the rate of discharge (the Project has the capability of managing water onsite and temporarily reducing its discharge rate);

- modifying the discharge structure to reduce the potential for erosion; and
- fortifying the channel downstream of the discharge location to enhance the resistance to erosion.

Also, in the event the flow monitoring identifies conditions that are likely to result in enhanced erosion (e.g., downstream flows that are more than 30% higher than upstream flows or upstream flows that are at 90% of the stream capacity) Treasury Metals would implement mitigation measures by reducing the rate of discharge (the Project has the capability of managing water onsite and temporarily reducing its discharge rate) until conditions in Blackwater Creek allow for discharges to return to normal.

Additionally, if inspections of the downstream Blackwater Creek system, or if periodic satellite images of the Blackwater Creek system, indicate that undue erosion is occurring, or is likely to occur, due to Project related effects, then Treasury Metals would implement additional adaptive measures to reduce the risk of erosion.

Criteria for adaptive management in relation to potential water quantity effects are also expected to be developed within the *Fisheries Act* authorization.

13.9.6 Applicable Regulatory Instruments and Associated Government Agencies

The *Fisheries Act* authorization, issued by DFO, is expected to define conditions and adaptive management strategies related to the maintenance of creek flows and habitat. The permit to take water (PTTW) for mine dewatering, required from the MOECC, may also list conditions related to the maintenance of creek flows and fish habitat.

13.9.7 Program Responsibilities

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding surface water quantity monitoring, including actions required pursuant to the *Fisheries Act* authorization, and any requirements stipulated in conditions of the permit to take water (PTTW). The DFO would be responsible for ensuring that *Fisheries Act* obligations are carried out, and the MOECC would be responsible for ensuring that conditions of the PTTW are carried out. The ECA Agency would be responsible for ensuring that the follow-up program is carried out.

13.9.8 Reporting

It is anticipated that a regulatory surface water quantity monitoring program will be required as part of the *Fisheries Act* authorization process, and possibly also as a requirement of conditions stipulated in the PTTW for mine dewatering, and that these instruments will have a reporting requirement.

Additionally, Treasury Metals intends to provide the surface water quantity monitoring results as part of the annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders.

13.10 Groundwater Quality

13.10.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives

The predicted effects of the Project on groundwater quality are summarized in Section 6.10.4 of the revised EIS. Groundwater quality predictions indicate that with the mitigation measures outlined in Section 6.10.5, no residual effects would remain during the life of the Project. During the operations phase, seepage from the onsite facilities would not leave the site due to the drawdown effect from dewatering activities capturing seepage. Although seepage would report to surface watercourse during post-closure, after the cessation of dewatering activities and after the groundwater levels return to near pre-development levels. This was assessed as an effect to surface water quality and presented in Section 6.8. Additionally, extensive groundwater modelling has determined that it is unlikely that seepage in the post-closure would affect drinking water well quality of any of the private wells in the area.

As part of the baseline groundwater quality data collection, Treasury Metals installed a number of groundwater monitoring wells and developed an extensive groundwater quality monitoring program. The EA monitoring program for groundwater quality is more detailed than many of the other monitoring programs due to the complexity and logistics of developing a groundwater well monitoring network for both groundwater quality and groundwater levels, along with the need to fully understand and model the dewatering zone of the Project. Additional wells will be installed as outlined in the following sections prior to the commencement of Project operations. The groundwater Follow-up program will continue from prior to site preparation and construction into the post-closure phase, stopping when regulators confirm that the closure landscape is functioning as planned and Treasury Metals can stop monitoring.

The groundwater quality monitoring program presented in the following sections will be included as both EA and regulatory monitoring programs. It is therefore subject to change following review and input from applicable government agencies. That stated, Treasury Metals is comfortable that the plan provided below will effectively capture all groundwater quality effects from the Project.

13.10.2 Rationale for Inclusion in the Follow-up program

The groundwater system ultimately connects with the surface water system, and there is the potential for long-term groundwater quality changes depending on the success ARD prevention measures over the longer-term. It is therefore important to effectively model, monitor and understand how groundwater moves through the system, especially following closure when the local groundwater table is restored once the open pit is flooded.

13.10.3 Proposed Monitoring Program

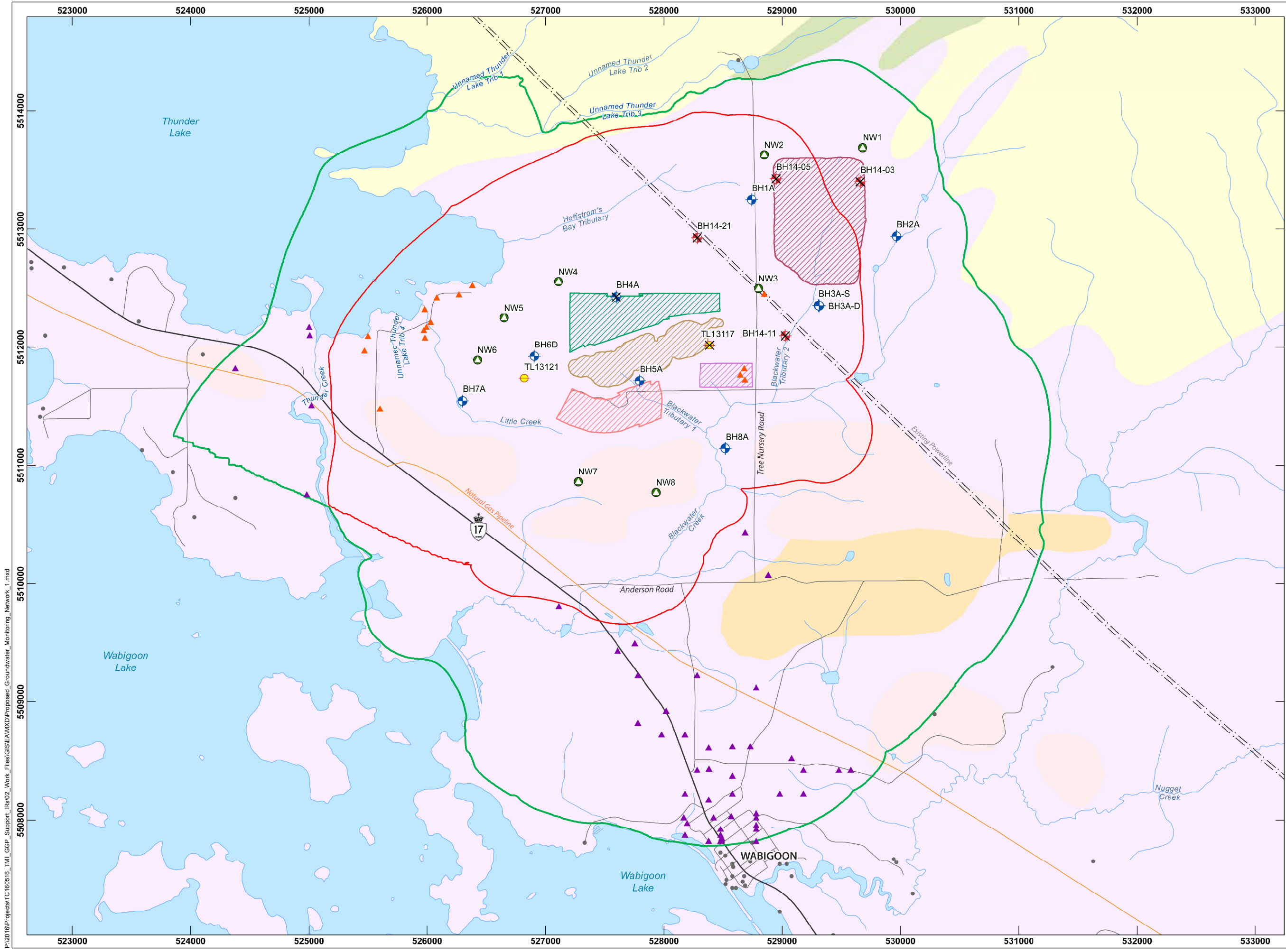
13.10.3.1 Groundwater Monitoring Wells

Groundwater monitoring wells will be either for groundwater sampling or groundwater level recording, with some wells serving both purposes. The primary horizon for groundwater flow is the shallow bedrock (SBR) horizon and, when present, the basal sand (BS) aquifer that occurs at the base of the fine-grained, clay dominated glaciolacustrine deposits (the dominant overburden of the Project area). Most monitoring wells will be screened within either the SBR or BS, or possibly both depending on ground conditions encountered during drilling. In the vicinity of the TSF, a sand-clay/silt-sand sequence occurs. In this location, wells will be nested to sample the surficial sand (SS) and BS if the sand-clay/silt-sand sequence is encountered (i.e., similar to the existing BH3A Shallow and BH3A Deep). The well screen in the SS will monitor the performance of the seepage collection ditches in collecting shallow horizontal groundwater flow out of the TSF, whereas the well screen in the BS will provide monitoring for vertical seepage out of the base of the TSF.

13.10.3.2 Groundwater Monitoring Installations

It is expected that a total of eight well screens and piezometers (six single-screen wells, one nested well and one nested vibrating wire piezometer [VWP]) of the current groundwater monitoring installations will be used for the future groundwater monitoring network. The locations of the monitoring wells in the proposed network are provided in Figure 13.10.3.2-1. The proposed monitoring wells are described below, and summarized in Table 13.10.3.2-1:

- The east-west striking mineralized zone is expected to have elevated bedrock hydraulic conductivities, which could influence the extension of the drawdown cone towards the west. The western VWP nest (TL131121) lies in a strategic location for measuring the groundwater pressure during dewatering around the mineralized zone to the west of open pit.
- Three of the wells are located around the TSF (BH1A, BH2A and BH3A) and one well close to the WRSA (BH6D) which are suitable for groundwater quality monitoring. BH2A is in an up-gradient location and would provide background groundwater quality data during operation of the TSF.



GOLIATH GOLD PROJECT
 DRYDEN, ONTARIO, CANADA

Figure: 13.10.3.2-1
 PROPOSED GROUNDWATER
 MONITORING NETWORK

Legend

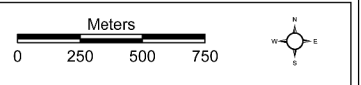
- 2013 Monitoring Well
- 2014 Geotechnical Hole
- Exploration Borehole with Vibrating Wire Piezometer
- MOE Well Outside ZOI
- MOE Well Within 5m ZOI
- MOE Well Within ZOI
- Proposed New Well for GWM Network
- Base Case 5m Drawdown
- Zone of Influence (ZOI)
- Stage 4 TSF Boundary
- Ultimate Pit Shell (Phase III)
- Low-Grade Stockpile
- Overburden Storage
- Waste Rock Storage
- Hydro Line
- Natural Gas Pipeline
- Highway 17
- Local Roadway
- Waterbody
- Watercourse

Landform

- GK: Kame
- GO: Glaciofluvial Outwash
- LP: Glaciolacustrine Plain
- OT: Organics
- RN: Bedrock Knob

Indicates well not proposed for future groundwater monitoring network

NOTES:
 1. UTM Zone 15N, NAD83
 2. Base Data Source: OBM
 3. 1:30 000 scale
 4. Well and Modelling Data by AMEC
 DATE: October, 2014
 DRAWN BY: AT
 CHECKED BY: AT
 REVISION: 00



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Table 13.10.3.2-1: Location and Type of Groundwater Quality Monitoring

Well ID	Location	Type	Screened Units	Monitoring Objective
BH1A	West of TSF, Nursery Road	Quality	BS/SBR	Down-gradient water quality of TSF
BH2A	East of TSF, Blackwater Creek	Quality	BS/SBR	Upstream of TSF – background groundwater quality in basal sand/shallow bedrock
BH3A-S BH3A-D	South of TSF, Blackwater Tributary 2	Quality	SS BS	Down-gradient water quality of TSF in shallow sand Down-gradient water quality of TSF in basal sand
BH6D	West of Open Pit and WRSA, proximal	Quality and level	BS	Water level proximal to open pit and down-gradient of WRSA
TL13121-S TL13121-D	West of Open Pit, proximal	VWP	IBR – 64 mbg IBR – 223 mbg	Pressure response to dewatering in open pit in intermediate bedrock along mineralized zone
New well #1 (nested)	North of TSF	Quality	SS and BS/SBR	Northern edge of TSF – nested piezometer assuming presence of Sand-Clay/Silt-Sand sequence
New well #2 (nested)	North-west of TSF, Nursery Road	Quality	SS and BS/SBR	Down-gradient water quality – nested piezometer assuming presence of Sand-Clay/Silt-Sand sequence
New well #3 (nested)	South-west of TSF, Nursery Road	Quality	SS and BS/SBR	Down-gradient water quality – nested piezometer assuming presence of sand-clay/silt-sand sequence
New well #4	North-west of Open Pit and WRSA	Quality and level	BS/SBR	Down-gradient water quality of WRSA and water levels distal to open pit, east of Thunder Lake
New well #5	West of Open Pit and WRSA	Quality and level	BS/SBR	Down-gradient water quality of WRSA and water levels distal to open pit, east of Thunder Lake

An additional eight monitoring locations will be installed, as per Figure 13.10.3.2-1 (proposed new wells for GWM network) to expand coverage of the groundwater quality monitoring network. These will include:

- Three wells (NW1, NW2 and NW3) are close to the perimeter of the TSF for groundwater quality monitoring. These will be nested with a screen in the SS and the BS/SBR (i.e., top and bottom of sand-clay/silt-sand sequence).
- Three wells (NW4, NW5 and NW6) with single screens in BS/SBR to the west of the open pit in distal locations to monitor groundwater levels between Thunder Lake and the perimeter of the Treasury property. Two of these will also be used for groundwater quality monitoring of the WRSA (NW4 and NW5).
- Two wells (NW7 and NW8) with single screens in BS/SBR are required to the south of the open pit in distal locations to monitor groundwater levels along the perimeter of the Treasury property in the direction of Wabigoon.

All the installations of the groundwater monitoring network will be constructed and/or modified where necessary to include protective casings and markings and, if required, a barricade to prevent damage by heavy equipment during mine construction and operation.

13.10.3.3 Groundwater Quality Monitoring

There are four single screen and four nested well locations in the groundwater quality monitoring program providing a total of 12 monitoring well screens. These wells are to be screened in the SBR and/or BS with the nested well locations having an additional screen in the SS where sand-clay/silt-sand sequence is present. Groundwater quality wells will be sampled at a frequency of four times per year. Water levels will be taken prior to sampling. Samples will be analyzed for the following parameters suites:

- Metals (dissolved);
- Cyanide in monitoring wells around TSF (total, free and weak acid dissociable (WAD) for first year, then total and WAD thereafter);
- Major anions and cations; and
- In-situ field parameters (temperature, reduction-oxidation potential, pH, dissolved oxygen).

Several existing wells in the proposed groundwater quality monitoring program have been sampled as part of baseline studies with the earliest sampling dating from June 2013. These wells will continue to be sampled.

As mentioned above, the groundwater quality program sampling frequency will be quarterly for the pre-construction, site preparation and construction, and operation phases. The pre-construction phase will provide for well installation a year before site preparation and construction so as to provide a year of baseline data.

13.10.3.4 Post-Closure

Groundwater quality monitoring would be continued at least until both the TSF and WRSA are capped. Termination of the program would be expected following a satisfactory review of the monitoring data collected during mine closure.

13.10.4 Current Mitigation Measures

The following measures have been incorporated into the Project to avoid or minimize the effects of the Project on groundwater quality have been considered in the modelling:

- Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit_008].
- Waste rock will be evaluated and segregated between PAG and NAG rock, if feasible. [Mit_019].
- The WRSA will be capped with a low permeability cover, then a layer of overburden, then vegetated during closure. [Mit_018].
- The PAG waste rock would be placed in the mined out areas of the open pit, to the extent practical. [Mit_020].
- The open pit will be allowed to flood at closure. [Mit_022].
- The floor of the TSF will be a low-permeability layer capable of achieving seepage rates that ensure receiving surface water quality is equivalent to baseline, or meet PWQO. The liner would be comprised of natural material, or if necessary, an HDPE liner laid over a prepared basin of sand or comparable material. [Mit_062].
- Perimeter runoff and seepage collection systems will be constructed around the TSF. [Mit_051].
- During operations, tailings will be maintained in saturated conditions, and a water cover will be maintained over the majority of the TSF to prevent the onset of acidification. [Mit_021].
- Tailings within the TSF will be isolated using either a low permeability dry cover, or a wet cover of non-process water. The preferred option for limiting environmental effects is a wet cover. [Mit_023].
- The drawdown zone of the dewatering process will capture all seepage that bypasses the seepage collection systems and will report to the open pit. [Mit_052].

13.10.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

In the event that significant degradation of groundwater quality is recorded from the groundwater monitoring network, this may trigger investigations, comprising:

- Recalibration of the groundwater model and update of predictions incorporating any changes to the mine plan. With the respect to groundwater quality this may include an assessment of post-closure conditions when the open pit no longer acts to capture groundwater.
- Installation of new monitoring wells and/or increase of frequency of monitoring (e.g. installation.
- Other investigations.

If the investigation determines a mine-related cause, mitigation measures to be completed, may include the following:

- Suitable replacement of private water supply until groundwater level recovery has occurred on completion of mining depending on location and requirements (e.g., deepening of existing water wells, drilling of new water wells, installation of cistern and supply of potable water).
- Containment measures if significant post closure adverse groundwater quality is predicted.

13.10.6 Applicable Regulatory Instruments and Associated Government Agencies

Groundwater quality is expected to be regulated through the PTTW for open pit dewatering, administered by the MOECC; and in the closure / post-closure environment by commitments and standards embodied within the mine Closure Plan administered by MNDM.

13.10.7 Program Responsibilities

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding groundwater monitoring, and updates to groundwater and geochemical modeling, including actions required pursuant to the PTTW and the mine Closure Plan. The MOECC and MNDM will be responsible for ensuring that these actions were carried out. The Agency would be responsible for ensuring that the follow-up program is carried out.

13.10.8 Reporting

A regulatory groundwater quality monitoring program will be developed during the permit to take water (PTTW) and mine Closure Plan processes, which will stipulate regulatory reporting requirements. Treasury Metals also intends to provide the groundwater quality monitoring results as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders. For any groundwater quality monitoring results that exceed management triggers, the Annual Follow-up program report will include the following:

- Results of the investigation to identify the cause of the elevated readings;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the elevated readings, if associated with the Project;
- Confirmation that the remedial actions were successful in addressing the issues; and
- Implication of groundwater and geochemistry model updates to groundwater quality predictions; and
- Any planned actions to respond to changes in groundwater and geochemistry model updates.

13.11 Groundwater Quantity

13.11.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives

The predicted effects of the Project on groundwater quantity were summarized in Section 6.11.4 of the revised EIS. After implementation of the mitigation measures outlined in Section 6.11.5, a single remaining residual adverse effect is anticipated: decreased flows in three surface watercourses, specifically, Blackwater Creek, Thunder Lake Tributary 2 and Thunder Lake Tributary 3. This residual effect would occur gradually as the dewatering activities at the site get underway, and the drawdown zone created by the dewatering expands to its maximum extent. Once the dewatering stops, the effects will diminish gradually as the groundwater slowly returns to near pre-development levels during the post-closure phase. This residual effect to groundwater quantity on surface water flows would be captured as part of the monitoring as part of the surface water quantity follow-up program outlined in Section 13.9.

A comprehensive groundwater quantity monitoring program will be developed as part of the permitting and approvals process under the MOECC to obtain a permit to take water (PTTW) for open pit dewatering. The PTTW will include details on monitoring groundwater levels in the drawdown zone. In addition, Treasury Metals will conduct groundwater level monitoring in the wells installed for baseline measurements to confirm the predicted location of the drawdown zone from dewatering activities. Section 13.10.3 describes the groundwater monitoring well network that will be used. The groundwater quantity follow-up program will begin prior to the start of dewatering activities, and will cease once the groundwater levels return to near pre-development levels in the post-closure phase.

13.11.2 Rationale for Inclusion in the Follow-up program

Unlike other creek systems associated with the Project site area, which are underlain by low permeability sediments, the upper reaches of Blackwater Creek and Thunder Lake Tributaries 2 and 3 are underlain by coarser glaciofluvial deposits. Changes in the groundwater regime due to open pit dewatering have the potential to affect baseflows in Blackwater Creek, Thunder Lake Tributary 2 and Thunder Lake Tributary 3, as well as the associated fish habitat in these watercourses Sections 6.9 (surface water quantity) and 6.14 (fish and fish habitat).

13.11.3 Proposed Monitoring Program

13.11.3.1 Groundwater Monitoring Wells

For information on groundwater monitoring network, please see Section 13.10.3. The locations of the proposed groundwater wells are shown on Figure 13.10.3.2-1, and a description of the monitoring wells provided in Table 13.10.3.2-1:

13.11.3.2 Groundwater Level Monitoring

There are nine single screen monitoring wells and one nested VWP in the groundwater level monitoring program with a total of 11 monitoring well screen and piezometers. These are generally completed in the SBR and/or BS where the most drawdown is expected to be observed.

Manual water level measurements will continue on a monthly basis in the existing wells, until the Project advances to a point where the installation of continuous loggers is warranted. However, prior to mining, all wells will be equipped with pressure transducers set to record water levels at least once per day, and downloaded on a quarterly basis. Two of the wells will be equipped with a barologger to allow data correction for barometric effects. A data logger will be obtained for the VWP nested piezometer and a similar recording and downloading frequency will be undertaken for this installation. Installation of new wells and pressure transducers/loggers will be done a year prior to mine construction.

13.11.4 Current Mitigation Measures

In the event that unexpected adverse groundwater level drawdown is recorded from the groundwater monitoring network, this may trigger investigations, comprising:

- Recalibration of the groundwater model and update of predictions incorporating any changes to the mine plan. With the respect to groundwater quality this may include an assessment of post-closure conditions when the open pit no longer acts to capture groundwater;
- Installation of new monitoring wells and/or increase of frequency of monitoring (e.g. installation; and
- Other investigations.

If the investigation determines a mine-related cause, mitigation measures to be completed, may include the following:

- Suitable replacement of private water supply until groundwater level recovery has occurred on completion of mining depending on location and requirements (e.g., deepening of existing water wells, drilling of new water wells, installation of cistern and supply of potable water).

With respect to the effects on surface water flows, should unexpected reductions in flows be observed as part of the surface water quantity follow-up program (Section 13.9), the effects would need to be mitigated through the program to compensate and offset for the loss or alteration of fish habitat.

13.11.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

In the event that groundwater drawdown affects the ability of existing wells to supply the required volumes of water, Treasury Metals would:

- Develop suitable replacement of private water supply until groundwater level recovery has occurred on completion of mining depending on location and requirements (e.g., deepening of existing water wells, drilling of new water wells, installation of cistern and supply of potable water).

In the event that groundwater drawdown results in should unexpected reductions in flows in Blackwater Creek, Thunder Lake Tributary 2 or Thunder Lake Tributary 3, further adaptive management measures would need to be considered, specifically with respect to the potential effects of reduced flows on fish and fish habitat.

13.11.6 Applicable Regulatory Instruments and Associated Government Agencies

The *Fisheries Act* authorization, issued by DFO, is expected to define conditions and adaptive management strategies related to the maintenance of creek flows and habitat. The permit to take water (PTTW) for mine dewatering, required from the MOECC, will list conditions related to the maintenance of nearby drinking water wells, and will list the requirement for contingencies in the event wells are affected. The PTTW may also list conditions related to the maintenance of creek flows and fish habitat, and may have conditions requiring contingency planning for these effects.

13.11.7 Program Responsibilities

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding groundwater quantity monitoring, including actions required pursuant to the *Fisheries Act* authorization, and any requirements stipulated in conditions of the PTTW. The DFO would be responsible for ensuring that *Fisheries Act* obligations are carried out, and the MOECC would be responsible for ensuring that conditions of the PTTW are carried out. The ECA Agency would be responsible for ensuring that the Follow-up program is carried out.

13.11.8 Reporting

It is anticipated that a regulatory groundwater quantity monitoring program will be developed during the PTTW process.

Treasury Metals intends to provide the groundwater quantity monitoring results as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders. In addition, for any groundwater quantity monitoring that exceed management triggers (see Section 12.3), the annual follow-up program report will include the following:

- Results of the investigation to identify the cause of the altered readings;

- Summary of the actions taken by Treasury Metals to mitigate or resolve the altered readings, if associated with the Project; and
- Confirmation that the remedial actions were successful in addressing the issues.

The Annual Follow-up program report will also include a summary of any public complaints regarding groundwater quantity, including:

- Private groundwater well level complaints;
- Actions taken to address the complaint; and
- Actions taken to mitigate the source of the complaint, if related to the Project.

13.12 Wildlife and Wildlife Habitat

13.12.1 Overview of Follow-up Program and Monitoring Objectives

The predicted effects of the Project on wildlife and wildlife habitat are summarized in Section 6.12.4 of the revised EIS. The predicted effects to wildlife indicate that even with the mitigation measures outlined in Section 6.12.5, residual effects would remain in terms of the loss of habitat, habitat alteration, and the potential for mortality during the site preparation and construction, operations, and closure phases of the Project. Additionally, in the context of the CEAA, 2012, the offsetting of habitat for SAR species required under the ESA and SARA would be considered mitigation that would offset and mitigate the adverse effects of the Project on these indicators. Therefore, following offsetting there are no residual adverse effects due to the Project related to habitat loss for SAR species. Refer to Table 6.12.9-1 for predicted effects to each VC during each phase of the Project.

A wildlife and wildlife habitat follow-up program will be implemented for the Project to ensure that effects to wildlife are as predicted in the EIS and that these effects are properly mitigated throughout the Project life. All associated wildlife monitoring will be based on standard, acceptable survey protocols. Where appropriate, these protocols will be the same as those used during the baseline data collection efforts, so changes in species abundance can be detected. The overriding objectives of the Follow-up program are as follows:

- Confirm the amount of direct loss of habitat resulting from Project activities;
- Identify unanticipated reductions in habitat suitability (applicable to areas outside of direct habitat loss areas), for species resulting from Project activities such as increased noise levels or levels of artificial light; and
- Identify whether there is use of alternate habitat with the LSA/RSA by SAR and other species.

Monitoring requirements for wildlife from a regulatory perspective will be required under the SARA and ESA and will only assess SAR species and habitat. Additionally, Treasury Metals will implement a wildlife and wildlife habitat Follow-up program to verify the accuracy of the EIS, as well as to verify that the mitigation measures outlined in Section 6.12.5 are effective. This monitoring program will include all VCs presented in Table 6.12.9-1.

13.12.2 Rationale for Inclusion in the Follow-up program

Wildlife are a critical resource to Indigenous peoples and they are important in their own right. SAR and SAR habitat are particularly important especially for those SAR species that are currently identified as being either Threatened or Endangered. Four SAR species listed as being Threatened or Endangered Federally or Provincially have been identified as occurring in the LSA, namely Common Nighthawk, Barn Swallow, Northern Myotis and Little Brown Myotis.

13.12.3 Proposed Monitoring Program

As discussed in section 5.11.3.2, Barn Swallow were observed throughout the property during baseline data collection surveys, and were generally associated with anthropomorphic structures. TMI has submitted an Information Gathering Form and an Alternatives Assessment Form for Barn Swallow, which is currently being review by the Dryden district OMNRF. It is anticipated that an Overall Benefit Permit will be required for the dismantling of some of the structures within the footprint which have previously hosted nesting Barn Swallow. Mandatory monitoring and follow-up reporting will be a condition of the Overall Benefit Permit.

Wildlife and Wildlife Habitat:

- Monitor wildlife species composition and abundance
 - Using the same protocols as used in baseline data collection so changes in species relative abundance can be detected.
 - To be completed every five years.
 - To be completed for the LSA and RSA.
- Utilization of offset habitat for SAR species
 - Use the same protocols as used in the baseline data collection to detect SAR species in the offset habitat.
 - To be completed 1 year following the offset habitat construction and at 5 year intervals thereafter.
- Utilization of operations area habitat following closure
 - Using the same protocols as used in the baseline data collection to determine if species are utilizing the rehabilitated operations area.
 - To be completed 5 and 10 years following closure.

- Keep log of large wildlife collisions (e.g., moose, deer, etc.) to determine effectiveness of speed limits and to identify areas of high wildlife collision potential in order to apply additional mitigation, and will include the following:
 - Date of collisions.
 - Time of collisions.
 - Location of collision.
 - Species that was hit.

13.12.4 Current Mitigation Measures

The following mitigation measures will be implemented as part of the Project to help avoid potential effects on wildlife and wildlife habitat:

- Project design incorporates a compact footprint. [Mit_050]
- Minimized the amount of habitat clearing required for the Project by siting Project infrastructure, to the extent practicable, in previously disturbed areas and optimizing the use of existing roadways. [Mit_065]
- Develop slope dependent vegetated buffers along rivers creeks and wetlands in conjunction with the MNRF. Buffers should be 120 m, wherever feasible. [Mit_066].
- Timber clearing will be conducted outside the breeding bird window (May 1 to August 15). [Mit_067].
- The WRSA will be capped with a low permeability cover, then a layer of overburden, then vegetated during closure. [Mit_018].
- Closure activities should include revegetation with species suitable for the development of habitats capable of supporting a diversity of wildlife species. [Mit_068].
- Enforcement of speed limits within the Project area. [Mit_069].
- Minimize disturbing areas with suitable bird breeding habitat, where practicable. [Mit_070].
- Wildlife awareness training for all staff will be provided including SAR identification/legislation and education regarding seasonal changes in animal behaviour and their presence. [Mit_071].
- Disposal of food waste generated on site will be done in an appropriate manner. [Mit_072].
- Clearing of potential terrestrial reptile and amphibian breeding habitats will be restricted to periods outside the breeding season as directed by MNRF. [Mit_073].
- Implementation of noise abatement strategies to limit the negative effects of sound on wildlife. [Mit_025, Mit_028, Mit_029, Mit_031].

- Develop a wetland clearing strategy with the local MNRF to reduce the effects to overwintering frogs (i.e. draining wetlands to discourage hibernation). [Mit_074].
- Where feasible, direct anthropogenic lighting to reduce excess production of light into the surrounding environment. [Mit_034, Mit_035, Mit_036, Mit_037, Mit_038, Mit_039, Mit_040, Mit_041, Mit_042].
- Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit_008].
- Industry standard erosion and sediment controls, such as sediment traps within ditches, will be implemented during the site preparations and construction phase. [Mit_054].
- If habitat destruction / damage cannot be avoided, alternate nesting habitat will be provided as a provision of compensatory habitat for species protected under the ESA. [Mit_075].
- Acceptable buffers will be provided around all raptor nests identified throughout all Project phases. [Mit_076].

13.12.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

It is anticipated that potential adverse effects to wildlife and wildlife habitat will be limited, and can be addressed through mitigation measures listed above, including the recognition that the Goliath Gold Project is a relatively small mining project, and that it is being developed on a site that has been, to a large extent, previously disturbed. That being said, there are two instances where additional mitigation or adaptive management could potentially be required, namely: if greater than expected effects to SAR were to occur, and responding to the occurrence of raptor nests if encountered. In such instances:

- If habitat destruction / damage cannot be avoided, alternate nesting habitat will be provided as a provision of compensatory habitat for species protected under the ESA. [Mit_075].
- Acceptable buffers will be provided around all raptor nests identified throughout all Project phases. [Mit_076].

13.12.6 Applicable Regulatory Instruments and Associated Government Agencies

If meaningful adverse effects to SAR are found to be likely to occur, then an ESA permit would be required to offset any such adverse effects. ESA permits and their conditions are administered by the MNRF. Development restrictions in relation to raptor nest sites are defined by the MNRF Significant Wildlife Habitat Mitigation Support Tool, Version 2014.

13.12.7 Program Responsibilities

Treasury Metals will be responsible for carrying out the wildlife follow-up program, and the Agency will be responsible for ensuring that follow-up program is carried out. MNRF will be responsible for ensuring that commits made in relation to an ESA permit (if required) are carried out by Treasury Metals.

13.12.8 Reporting

Treasury Metals intends to provide the wildlife and wildlife habitat monitoring results, including for SAR, as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders. For any wildlife and wildlife habitat monitoring that exceed the management triggers, the Annual Follow-up program report will also include the following:

- Results of the investigation to identify the cause of the effects to wildlife;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the effects to wildlife, if associated with the Project; and
- Confirmation that the remedial actions were successful in addressing the issues.

If no specific wildlife and wildlife habitat monitoring was completed during a particular year, the Annual Follow-up program report would provide a brief summary of results from the preceding year when monitoring was completed.

Additionally, separate reporting maybe be required in relation to any ESA permits issued in relation to the Project. The reporting requirements for any such requirement would be stipulated within the ESA permit(s), if applicable.

13.13 Migratory Birds

The monitoring for migratory birds has been included in the wildlife and wildlife habitat monitoring program described in Section 13.12.

13.14 Fish and Fish Habitat

13.14.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives

The predicted effects from the Project on fish and fish habitat are summarized in Section 6.14.4 of the revised EIS. Effect predictions indicated that even with the mitigation measures outlined in Section 6.14.5, there would still be a residual effect to fish habitat and potential fish mortality in Blackwater Creek Tributaries 1 and 2, as these tributaries will be permanently removed and overprinted for Project infrastructure. Efforts will be taken to minimize mortality to fish in these tributaries during this time by using best practices to relocate the fish further downstream in Blackwater Creek, but a conservative 50% potential for mortality has been predicted. Additionally,

direct loss of fish habitat by overprinting of the Project will need to be offset by the construction of new fish habitat, or by an improvement of fish habitat elsewhere. Because the construction of new fish habitat or improvement of fish habitat elsewhere is expected to more than offset the amount of fish habitat lost as a result of the Project, there is not expected to be a residual adverse effect associated with the loss of habitat that will remain following mitigation.

There would be no releases from the Project to surface waters during either the site preparation and construction phase, or the closure phase. During operations, excess water not required in the process will be treated to concentrations that meet Provincial Water Quality Objectives (PWQO) or Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life, or background if background levels exceed the PWQO, prior to discharging to Blackwater Creek. In the case of mercury, effluent will be treated to meet the background concentrations in Blackwater Creek. [Mit_053]. There would be no other releases from the Project that would affect surface water quality during operations. Following operations, dewatering activities will cease and the open pit will be allowed to fill with water. The pit lake will be monitored as it is filling to determine whether batch treatment will be required to ensure the water meets PWQO, or background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. [Mit_024]. Once the pit lake is fully flooded, it is expected that the monitoring of the water quality in the pit lake will continue for a period of time to determine whether additional batch treatment may be required to ensure the water released from the pit lake meets effluent release limits [Mit_124]. Water from the pit lake would be allowed to passively drain through an engineered spillway into the former channel of Blackwater Creek Tributary 1. Once the dewatering activities stop, the groundwater levels will begin to recover. Once the open pit is flooded and the groundwater returns to near pre-development levels, a small quantity of seepage from the onsite facilities (i.e., the WRSA and TSF) will leave the site and interact with nearby waterbodies. Modelling of post-closure water quality shows that water quality in the receiving water bodies will be equivalent to baseline conditions or meet the PWQO. As a result, no residual adverse effects on fish and fish habitat were predicted as a result of the changes in water quality due to the releases of deleterious substance into fish bearing waters.

The construction and operation of the Project is predicted to result in changes in flows in several of the surrounding waterbodies. During construction, a perimeter ditch and berm will be constructed around the operations area to ensure all Project affected water is contained, and to isolate the site from non-Project affected runoff. As a result of this activity, a small portion of the catchments of Little Creek and Hoffstrom's Bay Tributary will be enclosed within the operations area and the flows to those watercourses will be reduced. These effects will be permanent. During operations, the open pit and underground mine will need to be dewatered to create a safe working environment. This dewatering will result in a lowering of the water table and the creation of a drawdown zone, which is predicted to affect the baseflow in Blackwater Creek, Thunder Lake Tributary 2, and Thunder Lake Tributary 3, all of which have a portion of their catchments underlain by granular materials. Groundwater modelling has determined that there would be little or no effects on the baseflows in the other watercourse near the Project as these streams are underlain by fine materials. The Project will periodically require fresh water, which will be taken from the former MNR tree nursery irrigation ponds on Thunder Lake Tributaries 2 and 3.

Treasury Metals will not take more than 5% of the flow entering the irrigation ponds. Finally, the excess water at the site will be treated to meet PWQO, or CWQG, prior to discharge into Blackwater Creek, resulting in increased flows during certain periods. Although the Project will result in flow alterations in several watercourses, the magnitude of the predicted changes are not sufficient to have a measurable impact on fish populations.

As stated previously, the DFO will likely require Treasury Metals to develop a plan to offset the direct loss of fish habitat by overprinting of the Project. Treasury Metals have had preliminary conversations with DFO and believe that a combination of the construction of new fish habitat, and/or the improvement of existing fish habitat elsewhere will be sufficient to offset the direct losses of habitat. In addition, Treasury Metals are aware that an offsetting plan to compensate for the loss of fish habitat may also need to offset for habitat altered by the changes in flows described above.

Because the construction of new fish habitat or improvement of fish habitat elsewhere is expected to more than offset the amount of fish habitat lost as a result of the Project, there is not expected to be a residual adverse effect associated with the loss of habitat or changes in flows.

It is expected that regulatory fish and fish habitat effects monitoring will be completed as a requirement of the MMER under the *Fisheries Act*. This will consist of effluent and water quality monitoring that will be harmonized with the surface water quality monitoring program outlined in Section 13.8, as well as biological monitoring studies in the aquatic receiving environment to determine if mine effluent is causing any adverse effects to fish or fish habitat. This fish and fish habitat monitoring program will be developed with the help of a qualified aquatic biologist and submitted to DFO for approval. Additionally, it is expected that monitoring of the fisheries offsetting for the Project will also be required as a condition of the *Fisheries Act* authorization. The nature of this monitoring will be determined when the offsetting measures are finalized.

Notwithstanding anticipated regulatory monitoring requirements, which will be developed with input from ECCC, Treasury Metals have identified fish and fish habitat follow-up program that will be implemented to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. This program is subject to change pending *Fisheries Act* authorization follow-up and monitoring requirements; and any monitoring requirements that might be defined by the ECA issued by the MOECC.

13.14.2 Rationale for Inclusion in the Follow-up program

Creek fish habitat will be overprinted by Project development, and may also potentially be affected by open pit dewatering. Effluent discharged from the site, if it fails to achieve PWQO criteria might also adversely affect aquatic life in Blackwater Creek. *Fisheries Act* authorizations also typically require follow-up monitoring and implementation of adaptive management, if and as required.

13.14.3 Proposed Monitoring Programs

Monitoring of fish and fish habitat will have four components – water temperature, fish habitat, benthic invertebrate community and fish community, at each monitoring location.

Water temperature will be monitored with temperature loggers that include out of water detection (Onset HOBO TidbiT MX Temperature 400' or similar) from June 1 through September 30 each year, with temperature logged at half-hour intervals.

Fish habitat will be monitored using the Site Features, Channel Morphology module of the Ontario Stream Assessment Protocol ((Point-Transect Sampling for Channel Structure, Substrate and Bank Conditions - S4:M1; Stanfield, L. (editor). 2013. Ontario Stream Assessment Protocol. Version 9.0. Fisheries Policy Section. Ontario Ministry of Natural Resources. Peterborough, Ontario. 505 p.). The primary purpose of the habitat data is to provide context for the fish community. Other monitoring, for example the erosion monitoring, is intended to detect changes in physical habitat that might arise from the project.

The benthic invertebrate community will be assessed following the Ontario Benthic Biomonitoring Network protocol (Jones, C., K.M. Somers, B. Craig and T.B. Reynoldson. 2007. Ontario Benthos Biomonitoring Network: Protocol Manual. Queen's Printer for Ontario, 109p.). Samples will be collected using quantitative sampling methods. Organisms will be identified to lowest practical level. Abundance and standard indices of community composition (diversity, evenness, Hilsenhoff Biotic Index) will be calculated will be calculated and compared in order to assess change or lack thereof.

The fish community will be monitored using the single pass method of the Ontario Stream Assessment Protocol (Section 3 – Module 1). Total and relative abundance of species in the catches will be used to assess change or lack thereof

Monitoring of fish and fish habitat will be undertaken, at a minimum, at the following locations:

- Four representative reaches (2 upstream reference reaches and two potentially impacted reaches) of Blackwater Creek;
- One reach in Blackwater Creek Tributary 1, between the project footprint and Blackwater Creek;
- One reach in the upper catchment of Blackwater Creek Tributary 2;
- One reach in Blackwater Creek Tributary 2 between the project footprint and Blackwater Creek;
- One reach in Little Creek;
- One reach in Hoffstrom's Bay Tributary; and
- One reach in Thunder Lake Tributary 2

Fish and fish habitat Monitoring will commence in 2018 and be conducted annually for a minimum of three years. Subsequently, the monitoring will be conducted on a three-year cycle, to coincide with Environmental Effects Monitoring (EEM) that is required under the Metal Mining Effluent Regulation (MMER) of the *Fisheries Act*. Monitoring will continue until it is demonstrated that there are no unpredicted harmful effects on fish and fish habitat post-closure.

EEM requires biological (fish population health and benthic invertebrate community) monitoring, on a three-year repeating cycle, and the study design for each cycle must be reviewed and approved by Environment Canada prior to the study taking place (Environment Canada, 2012. Metal mining technical guidance for environmental effects monitoring, ix+539 p.). The established EEM triggers will be used to determine if additional actions (confirmation of effects, determination of cause, elimination of cause) are required. In addition to the field investigations, monitoring of effluent quality and laboratory testing of effluent toxicity is a legal requirement of EEM under the MMER.

13.14.3.1 Effluent and Water Quality Monitoring

This monitoring requirement is captured by the surface water quality monitoring program outlined in Section 13.8.3

13.14.3.2 Biological Monitoring

- Effluent
 - Acute and sub-lethal toxicity sample taken from end of pipe location will be conducted for benthic invertebrate and fish species, as prescribed by O. Reg. 560/94 and the MMER.
- Blackwater Creek
 - Acute and sub-lethal toxicity testing on benthic invertebrate and fish species from a sample taken downstream of the effluent discharge location. This monitoring should be done quarterly, and will supplement the monthly testing done on the effluent from the Project (see Table 13.8.3-1).
 - Survey of fish species composition using the same techniques used for baseline studies once every three years.
 - Monitoring of mercury in fish flesh would be undertaken in accordance with MMER Environmental Effects Monitoring protocols. These protocols provide for fish flesh monitoring of mercury if the concentration of total mercury in the effluent is equal to or greater than 0.10 µg/L. Where tissue sampling is indicated, the species selected for tissue analyses should be, if present, sport, subsistence and/or commercial species (including molluscs and crustaceans) where relevant. The fish species used for the tissue analysis may or may not be the same as the species used in the fish survey. On a site-specific basis, the tissue used for the analysis should be chosen based on

- the portion of the fish constituting the edible portion locally consumed, including the muscle, liver, eggs, hepatopancreas (crustaceans), bone or any other relevant portion.
- The results of supplemental screening for human and ecological receptors (completed as part of the Round 1 information requests) identified that the predicted concentrations of arsenic and lead in tailings, and or waste rock exceeded their MOECC component criteria protective of soil leaching and therefore chemical analysis for these additional parameters would be included in a monitoring program for fish tissue. An adaptive management strategy will also be considered. In the event changes in surface water quality are identified as part of the surface water quality follow-up and monitoring programs (as outlined in Section 13.8), then biological monitoring will be amended to reflect these changes. These amendments may include the analysis of additional chemical compounds in addition to mercury, arsenic, and lead.
 - Thunder Lake Tributaries 2 and 3
 - Survey of fish species composition using the same techniques used for baseline studies once every three years; and
 - An adaptive management strategy will be considered. If changes in surface water quality in Thunder Lake Tributaries 2 and 3 are identified as part of the surface water quality follow-up and monitoring programs (as outlined in Section 13.8), then biological monitoring via methods comparable to those outlined for Blackwater Creek will be completed.
 - Little Creek and Hoffstrom's Bay Tributary
 - Survey of fish species composition using the same techniques used for baseline studies once every three years; and
 - An adaptive management strategy will be considered. If changes in surface water quality in Little Creek and Hoffstrom's Bay Tributary are identified as part of the surface water quality follow-up and monitoring programs (as outlined in Section 13.8), then biological monitoring via methods comparable to those outlined for Blackwater Creek will be completed.
 - Control Site
 - Acute and sub-Lethal toxicity testing on benthic invertebrate and fish species, and
 - Survey of fish species composition using the same techniques used for baseline studies once every three years.

13.14.3.3 Fish Habitat Offset Monitoring

- Fish and fish habitat surveys of habitat offsets will be conducted to determine effectiveness. Specific monitoring methods will be developed through discussions with

DFO once the offsets are determined and will be described as one or more conditions of the *Fisheries Act* Authorization for the project.

13.14.4 Current Mitigation Measures

The following mitigation measures are incorporated into the design and planned implementation of the Project to avoid or limit adverse effects to fish and fish habitat:

- Prior to overburden removal, any beaver dams within the Project footprint will be removed and the impoundments will be allowed to draw down. [Mit_077].
- Activities and the construction of Project components that will impact or overprint watercourses will occur during the fisheries timing window when in-stream work is permitted. [Mit_078].
- To the extent practicable, fish in the sections of Blackwater Creek Tributary 1 that will be isolated by the construction of the perimeter ditch and overprinted by the removal of overburden from the open pit will be captured and relocated to the same tributary downstream from the operations area, or to the main branch of Blackwater Creek. [Mit_079].
- To the extent practicable, fish in the sections of Blackwater Creek Tributary 2 that will be isolated by the construction of the perimeter ditch and overprinted by the construction of the TSF and minewater pond will be captured and relocated to the same tributaries downstream from the operations area, or to the main branch of Blackwater Creek. [Mit_080].
- Project design incorporates a compact footprint. [Mit_050].
- Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit_008].
- Effectively manage water collected on-site using constructed storage facilities, reducing the need for fresh water withdrawals and discharges of treated water. [Mit_057].
- Fresh water takings from tree nursery irrigation ponds on Thunder Lake Tributaries 2 and 3 will not exceed 5% of the flow entering the ponds. [Mit_059]
- Pump intakes in the irrigation ponds at the former MNRF tree nursery will be fitted with fish screens to prevent entrainment. [Mit_081].
- During operations, excess water not required in the process will be treated to concentrations that meet Provincial Water Quality Objectives (PWQO) or Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life, or background if background levels exceed the PWQO, prior to discharging to Blackwater Creek. In the case of mercury, effluent will be treated to meet the background concentrations in Blackwater Creek. [Mit_053].

- An engineered structure, designed to dissipate flows and avoid erosion, will be constructed to discharge effluent during operations into Blackwater Creek. [Mit_058].
- The pit lake will be monitored as it is filling to determine whether batch treatment will be required to ensure the water meets PWQO, or background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. [Mit_024].
- Once the open pit has been filled, excess water from the open pit will be passively released through an engineered spillway into the existing channel of Blackwater Creek Tributary 1. [Mit_060].
- Provide offsetting of fisheries habitat losses as part of the authorization required under the *Fisheries Act*. [Mit_083].

In addition, the Project will require a *Fisheries Act* authorization and will likely require Treasury Metals to mitigate the losses of fish habitat that it causes as a condition of that authorization. Typically, the offsetting involves the creation of new habitat or the enhancement of existing habitat that is commensurate with the habitat losses. The *Fisheries Act* authorization, which is issued by DFO, details the offsetting measures to be completed and, typically also specifies monitoring to be conducted. DFO uses a letter of credit to provide a financial assurance mechanism in the event that an offsetting plan is not completed [Mit_083].

13.14.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

Criteria for considering adaptive management measures would include the following:

- Final effluent quality does not meet PWQO, such that adverse water quality effects to aquatic life in Blackwater Creek are anticipated, or shown to occur;
- Baseflow reductions in Project area creeks due to groundwater drawdown effects, linked to open pit dewatering, are greater than anticipated and detrimental to fish habitat;
- Fish community changes is observed in which a dominant species, defined as a species that comprised more than 20% of the total numbers caught during baseline, does not appear in the catch;
- Benthic invertebrate community indices fall outside of the normal range for similar habitats; and
- Fish habitat offset measures fail to perform as intended.

A commitment has been made to treat effluent releases from the Project during operations to Provincial Water Quality Objectives (PWQO) or Canadian Water Quality Guidelines (CWQG) prior to release into Blackwater Creek. If monitoring data should indicate that this commitment is not being fulfilled, Treasury Metals would review and implement further treatment measures and/or optimizations to achieve this commitment. If the changes in flows resulting from Project

construction, groundwater drawdown, and operations are greater than anticipated (see Section 13.9) and detrimental to fish habitat, or if fish habitat offset measures fail to perform as intended, discussions would be held with DFO as to the potential need for additional fish habitat offsets.

13.14.6 Applicable Regulatory Instruments and Associated Government Agencies

The *Fisheries Act* authorization, issued by DFO, is expected to define fisheries monitoring and adaptive management strategies related to the maintenance of creek flows and habitat, and performance of fish habitat offset measures. The PTTW for mine dewatering, required from the MOECC, may also list conditions related to the maintenance of creek flows and fish habitat, and may have conditions requiring contingency planning. The ECA, also issued by the MOECC, will stipulate final effluent concentration limits to protect receiving water quality and associated aquatic life.

13.14.7 Program Responsibilities

Treasury Metals will be responsible for carrying out the fish and fish habitat Follow-up program and all associated monitoring programs. The CEA Agency will be responsible for ensuring that the Follow-up program is carried out. DFO will be responsible for ensuring that follow-up provisions of the *Fisheries Act* authorization are carried out, and the MOECC will be responsible for ensuring that monitoring programs associated with the ECA and PTTW are carried out, including any required contingency measures.

13.14.8 Reporting

It is expected that a regulatory fish and fish habitat monitoring program will be developed during the permitting process, which will stipulate regulatory reporting requirements under applicable Federal and Provincial acts and regulations.

Treasury Metals intends to provide the fish and fish habitat Follow-up program results as part of the annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders. For any fish and fish habitat monitoring that exceeded the management triggers, the annual follow-up program report will include the following:

- Results of the investigation to identify the cause of the effect to fish and fish habitat or changes in aquatic species composition;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the effect to fish and fish habitat, if associated with the Project; and
- Confirmation that the remedial actions were successful in addressing the issues.

13.15 Wetlands and Vegetation

13.15.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives

The predicted effects from the Project on wetlands and vegetation are summarized in Section 6.15.4 of the revised EIS. Effects predictions have identified that even with the mitigation measures outlined in Section 6.15.5, residual adverse effects will remain in the form of natural wetland area loss as well as alterations in vegetation communities and species composition. However, this does not take into consideration the habitat that will be constructed and reclaimed following closure, with parts of the open pit and TSF becoming wetland habitat and native species being planted on the reclaimed site.

Through baseline wetland and vegetation studies, no SAR plant species have been identified within the LSA. Therefore, there is no identifiable need for regulatory monitoring of vegetation or wetlands by Treasury Metals.

Treasury Metals have nevertheless identified a wetland and vegetation Follow-up program that will be implemented to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. Because of the compact nature of the Project footprint, most of the vegetation within the operations area will be cleared. Therefore the Follow-up program will focus on the effects to adjacent wetlands, and the vegetation present in those wetlands.

13.15.2 Rationale for Inclusion in the Follow-up program

Areas and types of vegetation habitat that are removed as a result of Project development require verification relative to EA predictions. Groundwater drawdown resulting from open pit dewatering has the potential adversely affect wetland communities through water level changes. Dust emissions from haul road traffic and mineral waste stockpile operations have the potential to adversely affect plant growth in adjacent areas through dust accumulation on leaves and flowers.

13.15.3 Proposed Monitoring Program

13.15.3.1 Wetlands

- Wetland extent mapping will be carried out to determine the wetland extent within the LSA, and the 2 m groundwater drawdown zone:
 - Mapping to be conducted every 5 years beginning just prior to the start of operations.
 - Mapping will be completed using OWES.
- Water level monitoring will be conducted to ensure no impacts to wetland water levels inside the drawdown zone is occurring:
 - Conducted on wetlands located within the drawdown zone.

- Water level will be collected and downloaded using water level loggers and barometric pressure loggers.

13.15.3.2 Vegetation

- Areas and types of vegetation habitat removed as a result of Project development;
- Monitoring of visual signs to dust accumulation on plant surfaces adjacent to roadways and active mining areas;
- Monitor whether the mitigation measures outlined in Section 6.15.5 have been properly implemented; and
- Wetland floral surveys will be conducted to verify that wetland species diversity is maintained:
 - Conducted on wetlands located within the drawdown zone.
 - Survey will be completed every 5 years beginning just prior to the start of operations.
 - Surveys will be completed using the same procedures as done in the wetland baseline study.

13.15.4 Current Mitigation Measures

The following mitigation measures will be implemented as part of the Project to help avoid potential effects on wetlands and vegetation:

- Project design incorporates a compact footprint. [Mit_050].
- Minimized the amount of habitat clearing required for the Project by siting Project infrastructure, to the extent practicable, in previously disturbed areas and optimizing the use of existing roadways. [Mit_065].
- Retention of forested areas wherever feasible. [Mit_084].
- Identification and protection of known vegetative SAR locations. [Mit_085].
- Avoid broadcast spraying of herbicides for vegetation management. [Mit_086].
- As the Project advances, detailed engineering will be completed to ensure that all downstream culverts can support any predicted increases in flows and maintain current levels of fish passage. [Mit_082].
- Develop slope dependent vegetated buffers along rivers creeks and wetlands in conjunction with the MNRF. Buffers should be 120 m, wherever feasible. [Mit_066].
- Develop sediment and erosion plans which will reduce sedimentation into wetlands and reduce the potential for dust cover on roadside vegetation [Mit_008, Mit_046, Mit_054].

- Closure activities should include revegetation with species suitable for the development of habitats capable of supporting a diversity of wildlife species. [Mit_068].
- Develop a wetland clearing strategy with the local MNR to reduce the effects to overwintering frogs (i.e. draining wetlands to discourage hibernation). [Mit_074].
- Re-vegetation of all slopes after closure with a focus on riparian habitat in the open pit. [Mit_068, Mit_087].
- Reclamation and re-vegetation of the mining footprint will be carried out in accordance with O.Reg. 240/00. [Mit_088].
- Seeding or hydroseeding with native seed mix. [Mit_089].

In addition, Treasury Metals will:

- Identify and protect the locations of any known SAR or provincially significant plant. [Mit_085].

13.15.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

Vegetation community clearing for Project development is a function of overall development plans and is not expected to change other than for minor changes in final design, such as TSF or stockpile slope angle changes needed for improved stability. To prevent unnecessary clearing adjacent to planned structures of facilities, a further adaptive measure that could be implemented would be to mark planned development limits with flagging tape or other similar means.

If monitoring shows that there is excessive dust accumulation on plants bordering haul roads and other work areas, increased watering would be used during dry periods to better manage dust emissions at source.

If wetlands are adversely affected to a level greater than predicted in the EIS, consideration would be given to the development of wetland offsets, if the adverse effects are considered to be significant and there are practical means of developing new wetlands without adversely affecting other environmental functions. This could include developing additional impoundments along watercourses, similar to those resulting naturally from beaver activity.

13.15.6 Applicable Regulatory Instruments and Associated Government Agencies

The only regulatory instrument relating to vegetation and wetlands is the closure plan requirements to revegetate the mine site as part of mine closure planning, in accordance with Part VII of the *Mining Act*. Closure plans are administered by MNDM.

13.15.7 Program Responsibilities

Treasury Metals is responsible for carrying out the Follow-up program and implementing the filed closure plan as part of mine permitting. The CEA Agency is responsible for ensuring that the Follow-up program is carried out. MNDM is responsible for ensuring that the closure plan is carried out.

13.15.8 Reporting

Treasury Metals intends to provide the wetlands and vegetation monitoring results as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders on an annual basis. For any wetland and vegetation monitoring that exceeded the management triggers, the Annual Follow-up program report will include the following:

- Results of the investigation to identify the cause of the effects to wetlands and vegetation;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the effects to wetlands and vegetation, if associated with the Project; and
- Confirmation that the remedial actions were successful in addressing the issues.

If no specific wetland or vegetation monitoring was completed during a particular year, the Annual Follow-up program report would provide a brief summary of results from the preceding year when monitoring was completed.

13.16 Land Use

13.16.1 EA prediction and Overview of Follow-up program and Monitoring Objectives

The predicted effects of the Project on land use were presented in Section 6.16.4 of the revised EIS. The predictions show that, even with the mitigation measures presented in Section 6.16.5, a number of residual adverse effects to land use remained. However, the majority of these changes relate to biophysical aspects listed immediately below, which are captured within Follow-up program related to these aspects, and are captured elsewhere in Section 13 of the revised EIS.

These include:

- Noise and Vibration follow-up (see Section 13.4);
- Light follow-up (see Section 13.5);
- Air Quality follow-up (see Section 13.6);
- Surface Water Quality follow-up (see Section 13.8);
- Groundwater Quality follow-up (see Section 13.10);

- Wildlife follow-up (see Section 13.12); and
- Social follow-up (see Section 13.17).

The only exception is traditional land and resource use (TLRU), where such use can be influenced by matters which extend beyond the strictly biophysical environment. These matters can include more abstract aspects of land and resource use such as confidence in environmental monitoring results, changing markets and product supplies, changes to income and employment status, and potentially other factors relating to changing cultural awareness and practices. Insight in these aspects can only be gained through ongoing dialogue with potentially affected Indigenous community members to determine if their current TLRU in the Project area are changing over time, and whether or not these changes are linked to Project effects, or to other causes. In Sections 6.21 (Aboriginal peoples) and 6.22 (traditional land and resource use by Indigenous communities) of the revised EIS, it was determined that TLRU in the general Project area is unlikely to be meaningfully altered as a direct result of Project development.

13.16.2 Rationale for Inclusion within the Follow-up program

Traditional land and resource use (TLRU) has been identified as a critical aspect of the lifestyles of local Indigenous community members. To a large extent continued TLRU is a function of the health of the general environment and its overall productivity, which is captured elsewhere in Section 13. However, as per the above, there are many other factors that can also affect TLRU that go beyond these biophysical aspects.

13.16.3 Current Mitigation Measures

Current mitigation measures are directed at minimizing adverse effects to the biophysical environment, so as to not meaningfully alter the potential use of the land by Indigenous community members. The adjunct to this is continued dialogue with potentially affected Indigenous communities to better understand their continuing use of the land and its resources in relation to Project development and operations. Treasury Metals hopes to achieve this end through ongoing community meetings, and through development of an Environmental Management Committee (EMC), or similar body, whereby environmental concerns and insights can be brought forward in a constructive manner, that will allow effective dialogue and resolution of outstanding matters.

13.16.4 Criteria for Considering Adaptive Management and Potential Adaptive Measures

Criteria for considering adaptive management and potential adaptive measures for strictly biophysical VCs are addressed elsewhere in Section 13. Ongoing dialogue with potentially affected Indigenous communities, including through and EMC (or equivalent) is its an adaptive process.

13.16.5 Applicable Regulatory Instruments and Associated Government Agencies

There are no applicable regulatory instruments involving TLRU, outside of those that are intended to manage strictly biophysical elements, which described separately in this section.

13.16.6 Program Responsibilities

Treasury Metals is responsible for carrying out the Follow-up program and implementing the filed closure plan as part of mine permitting. The CEA Agency is responsible for ensuring that the Follow-up program is carried out.

13.16.7 Reporting

All of the applicable Follow-up program that encompass strictly biophysical land use effects from the Project will be reported on either to government agencies, or within the Annual Follow-up program report that will be provided to government agencies, Indigenous peoples and stakeholders. Follow-up program aspects relating to other more abstract aspects of TLRU will also be reported as part of the Annual Follow-up program report, to the extent that these matters are not considered confidential by the involved Indigenous communities.

13.17 Social

13.17.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives

The predicted effects of the Project on social aspects of the local and regional study areas were presented in Section 6.17.4 of the revised EIS. The predictions show that, even with the implementation of mitigation measures presented in Section 6.17.5, a number of residual effects will remain to the social dynamics of the local and regional communities. However, some of these residual effects to social aspects are expected to be beneficial to communities in the local and regional study areas. Treasury Metals will develop Follow-up programs with input from government agencies, Indigenous peoples and local stakeholders, to verify the effectiveness of the mitigation measures presented in Section 6.17.5, and monitor the extent of the positive and negative residual effects presented in Section 6.17.6. The proposed Follow-up programs for social aspects of the Project, which will be developed with engagement with the aforementioned groups, as appropriate, to address the following aspects:

- In-migration / out-migration of employees;
- Local hiring;
- Training;
- Housing availability;
- Real estate values;

- Crime;
- Emergency services; and
- Traffic accidents related to Project activities.

13.17.2 Rationale for Inclusion in the Follow-up program

The preceding list of social aspects have been raised in comments received from Indigenous communities and other stakeholders, and are aspects which are both important to the overall area social fabric, and which can be reasonably measured and verified.

13.17.3 Proposed Monitoring Program

Several of the preceding list of social aspects can be tracked through Company human resource and health and safety records. These include:

- In-migration / out-migration of employees;
- Local hiring;
- Training;
- Use of emergency services; and
- Traffic accidents related to Project activities.

The remaining aspects will require assistance from local governments, or in the case of crime general information from police records.

13.17.4 Current Mitigation Measures

Currently proposed mitigation measures include:

- Effective communications (ongoing engagement with potentially affected stakeholders and members of Indigenous communities);
- Socio-economic monitoring and management (development of a socio-economic monitoring and management plan designed to address potential Project-related socio-economic effects);
- Local hiring (employment and business practices that give preference to local and regional labour to the extent possible, including to Indigenous communities);
- Workforce development (development of training policies and programs);
- Education enrollments (communicate education requirements needed for employment);
- Support infrastructure and services (work with local and regional governments to minimize the effects of in-migration and out-migration; and

- Promote worker and public safety (site security services; develop safety and work policy guidelines for mine workers, suppliers and contractors).

13.17.5 Criteria for Considering Adaptive management and Potential Adaptive Measures

For those aspects which are within, or partly within, the ability of Treasury Metals to control (e.g., hiring and training, use of emergency services), Treasury Metals will strive for ongoing improvement); but no specific targets or thresholds have been set to date.

13.17.6 Applicable Regulatory Instruments and Associated Government Agencies

Applicable regulatory instruments and government agencies would be those pertaining to labour laws, general health and safety, municipal plans, and policing. These are not environmental instruments in the general sense.

13.17.7 Program Responsibilities

Treasury Metals is responsible for carrying out the Follow-up program. The Agency is responsible for ensuring that the Follow-up program is carried out.

13.17.8 Reporting

A number of commitments have been made regarding social aspects of the Project in the local and regional study areas, which will require follow-up reporting through the EA process. These include Treasury Metals' commitments such as to hire locally [Cmt_003], and purchase locally [Cmt_004]. Notwithstanding, Treasury Metals intends to provide the social monitoring results as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders on an annual basis.

13.18 Economic

13.18.1 EA Prediction Overview of Follow-up program and Monitoring Objectives

The predicted effects of the Project on the economic climate of the local and regional study areas were presented in Section 6.18.4 of the revised EIS. The predictions show that, even with the implementation of mitigation measures presented in Section 6.18.5, a number of residual effects will remain to the economics of the local and regional communities. These residual effects to economic aspects are, for the most part, expected to be beneficial to communities in the local and regional study areas. Treasury Metals will develop Follow-up programs with input from government agencies, Indigenous peoples and local stakeholders, as appropriate, to verify the effectiveness of the mitigation measures presented in Section 6.18.5, and monitor the extent of the positive and negative residual effects presented in Section 6.18.6. To date, there have been five proposed Follow-up programs for the economic effects of the Project, which will be developed following consultation with the aforementioned groups. These proposed programs include:

- Employment;
- Business and contracting opportunities;
- Training courses;
- Worker profile (e.g., local vs in-migrant worker); and
- Economic commitments.

A number of these programs (employment, training, worker profile) overlap with elements of the social follow-up program. The added factor for the economic VC would be estimating dollar values, where appropriate.

13.18.2 Rationale for Inclusion in the Follow-up program

The primary reason that government agencies, Indigenous peoples, local residents and other stakeholders are willing to support projects of this type, are that they bring added prosperity to the local, regional, Provincial and national economies. It is therefore incumbent on Treasury Metals to be able to demonstrate that such benefits have in fact actually accrued.

13.18.3 Proposed Monitoring Program

The proposed monitoring program will consist of tracking various economic metrics on an annual basis. This will include tracking:

- Numbers of employment positions, including estimates of contracting positions;
- Values of business contracts;
- Training program values;
- Worker and contracting origins / affiliations (Indigenous, local, regional, etc.); and
- General operating expenditures (as per Company annual reports).

13.18.4 Current Mitigation Measures

Current mitigation measures relating to economics include:

- Local hiring (employment and business practices that give preference to local and regional labour to the extent possible, including to Indigenous communities);
- Workforce development (development of training policies and programs); and
- Education enrollments (communicate education requirements needed for employment).

13.18.5 Criteria for Considering Adaptive Measures and Potential Adaptive Measures

The Company will strive for ongoing improvement; but no targets or thresholds have been or will be set at this time.

13.18.6 Applicable Regulatory Instruments and Associated Government Agencies

Applicable regulatory instruments and government agencies would be those pertaining to labour, business and tax laws. These are not environmental instruments in the general sense.

13.18.7 Program Responsibilities

Treasury Metals is responsible for carrying out the Follow-up program. The CEA Agency is responsible for ensuring that the Follow-up program is carried out.

13.18.8 Reporting

A number of commitments have been made regarding economic aspects of the Project in the local and regional study areas, which will require Follow-up program reporting through the EA process. These include Treasury Metals' commitments to hire locally (Cmt_003), and purchase locally (Cmt_004). Notwithstanding, Treasury Metals intends to provide the economic monitoring results as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders on an annual basis.

13.19 Human Health

13.19.1 EA Prediction Overview of Follow-up program and Monitoring Objectives

Treasury Metals completed a screening level human health risk assessment to determine if there was the potential for human or ecological health risks associated with the proposed Project. The predicted effects of the Project on human health were presented in Section 6.19 of the EIS. The predictions show that, with risk management measures in place there are no potential risks as a result of the Project to non-Indigenous and Indigenous human receptors. No adverse residual effects were identified.

The screening level risk assessment was completed using the most conservative assumptions and input parameters defined by Health Canada, The Canadian Council of Ministers of the Environment (CCME), and/or the Ontario Ministry of Environment and Climate Change (MOECC). The results of the risk assessment indicated that with the appropriate risk management measures incorporated into the design of the project. The risk assessment did not identify any potential human health risks as a result of the Project, however confirmed the preexisting knowledge that mercury concentrations in fish remain elevated and the fish consumption advisory in place by the MOECC in the Project area should be respected and adhered to.

The risk assessment completed for the EIS stage of the proposed Project was appropriately completed as screening level. As part of a follow-up program, a more detailed risk assessment may be completed using site-specific receptors, exposure parameters including bioavailability assessments, and revised toxicity data if required. Most importantly any follow-up risk assessment should be completed using updated exposure point concentrations from measured data i.e. soil (baselines soils, tailings, and waste rock), groundwater, air, country foods collected as part of other Follow-Up and Monitoring Programs outlined in Section 13, rather than the modelled data.

A follow-up human health (HHRA) risk assessment may include the following:

Receptors

- Outdoor Workers;
- Subsurface/Construction Workers;
- Residents; and
- Members of Indigenous Communities.

Exposure Pathways

- Dermal contact and incidental ingestion of soil (which includes baseline soils, tailings, and waste rock);
- Inhalation of outdoor dust (particulate in air from baseline soils, tailings, and waste rock);
- Inhalation of outdoor air impacted by subsurface vapour intrusion;
- Inhalation of indoor air impacted by subsurface vapour intrusion;
- Ingestion of groundwater as drinking water (potable groundwater); and
- Ingestion impacted food items (plants and wild game).

A qualitative assessment of other human health receptors or pathways may be performed where determined to be reasonably appropriate by a risk assessment professional.

Contaminants of concern (COCs) may be selected based on exceedances of the MOECC Site Condition Standards, and human health screening would be initially completed against the appropriate MOECC risk-based component criteria. In the absence of screening criteria from the MOECC, additional guidelines or standards may be selected from Health Canada or Federal Contaminated Sites Action Plan (FCSAP) guidance. The follow-up HHRA would be completed as per the most current Health Canada Preliminary Quantitative Risk Assessment (PQRA) or Detailed Quantitative Risk Assessment (DQRA) guidance available.

A follow-up ecological (ERA) risk assessment may include the following:

Receptors

- Plants and soil dwelling organisms;
- Mammals and Birds; and
- Aquatic biota.

Exposure Pathways

- Direct terrestrial ecological contact;
- Contaminant bioaccumulation into higher tropic level organisms;
- Soil leaching to groundwater and migration to downgradient surface water bodies; and
- Groundwater migration to downgradient surface water bodies.

A qualitative assessment of other ecological receptors or pathways may be performed where determined to be reasonably appropriate by a risk assessment professional. This may include pathways or receptors identified by Indigenous communities to be particularly important to their traditional land and resource use or based on traditional knowledge. It may also include site-specific species that are identified to be provincially or federally protected as a species at risk.

Contaminants of concern (COCs) may be selected based on exceedances of the MOECC Site Condition Standards, and ecological screening may be initially completed against the appropriate MOECC risk-based component criteria. In the absence of screening criteria from the MOECC, additional guidelines or standards may be selected from CCME or Federal Contaminated Sites Action Plan (FCSAP) guidance. The follow-up ERA would be completed as per the most current FCSAP or CCME guidance available.

In the event that a follow-up risk assessment identified potential risk to human or ecological receptors in exceedance of the appropriate regulatory risk-based benchmarks then amendments to the current risk management measure could be made, or the implementation of additional risk management measures would be considered.

13.19.2 Rationale for Inclusion in the Follow-up program

Risk assessment science is constantly evolving to reflect changes in toxicology, and current scientific consensus regarding contaminant transport and fate. Subsequently, Government agencies including Health Canada and the Ontario Ministry of Environment and Climate Change are updating their risk assessment guidance document and associated risk assessment models, and risk assessments should be completed as per the most up-to date consensus among the risk assessment community. In addition, via ongoing meaningful engagement activities, the site-specific knowledge of the use of the lands surrounding the Project is expected to continually evolve and as a result the exposure scenarios used in the risk assessment should be revised to

reflect the more site-specific knowledge. Furthermore, as other follow-up and monitoring programs produce updated chemical concentrations in soil, groundwater, surface water and air, a revised contaminant of concern list may be required including supplemental screening for human health. A follow-up risk assessment would be required to reflect changes in the predictions made as part of the EIS process.

From a regulatory perspective, a risk assessment is not anticipated to be required based on the land use plans of the Project and the conservative risk management measures incorporated as part of the project design.

13.19.3 Proposed Monitoring Program

No proposed monitoring is required specific to human health. It is anticipated that monitoring for the other disciplines would be sufficient to provide a follow-up risk assessment that is comprehensive in nature.

13.19.4 Current Mitigation Measures

As there were no predicted adverse effects, no additional mitigation measures beyond the avoidance measures outlined in Section 6.19.3 have been identified.

13.19.5 Criteria for Considering Adaptive Measures and Potential Adaptive Measures

The Company will strive for ongoing improvement; the current Health Canada and or MOECC risk-based benchmarks will be applied. In the event a follow-up risk assessment identifies potential risk to one or more human receptors, site-specific target levels for COCs in soil, groundwater, surface water or air may be derived following Health Canada DQRA guidance.

13.19.6 Applicable Regulatory Instruments and Associated Government Agencies

Applicable regulatory instruments and government agencies would be those pertaining to health and the environment including Health Canada, Environment and Climate Change Canada, Department of Oceans and Fisheries, and provincially the MOECC.

13.19.7 Program Responsibilities

Treasury Metals is responsible for carrying out the Follow-up program. The CEA Agency is responsible for ensuring that the Follow-up program is carried out.

13.19.8 Reporting

A number of commitments have been made regarding economic aspects of the Project in the local and regional study areas, which will require Follow-up program reporting through the EA process. From a regulatory perspective, a risk assessment is not anticipated to be required based

on the land use plans of the Project and the conservative risk management measures incorporated as part of the project design. Thus, the frequency of a follow-up program cannot be determined at this time, and would be determined following industry best practices.

13.20 Heritage Resources

The archeological assessment (Appendix U to the revised EIS) did not identify the need for follow-up monitoring for archaeological sites. In addition, it was the recommendation of the assessment that the development area did not “exhibit archaeological potential therefore it is recommended that the location does not require further archaeological assessment”. That stated, Archeological and Cultural Heritage Resources Management Plan has been developed for the Project (see Section 12.11) that will provide specific policies, procedures, and contact information in the event any heritage resource is uncovered during any phase of the Project.

13.21 Aboriginal Peoples

The predicted effects of the Project on Aboriginal peoples who are members of an Indigenous community were presented in Section 6.21.4 of the revised EIS. The predictions show that, even with the implementation of mitigation measures presented in Section 6.21.5, a number of residual effects will remain to Aboriginal peoples. However, some of these residual effects are expected to be beneficial to Aboriginal peoples in the local and regional study areas. The Follow-up program of some of the effects to Aboriginal peoples as a result of the Project is effectively captured within other Follow-up programs outlined in Section 13 of the revised EIS. These include:

- Noise and Vibration follow-up (see Section 13.4);
- Light follow-up (see Section 13.5);
- Air Quality follow-up (see Section 13.6);
- Surface Water Quality follow-up (see Section 13.8);
- Groundwater Quality follow-up (see Section 13.10);
- Wildlife follow-up (see Section 13.12);
- Fish and Fish Habitat follow-up (see Section 13.14)
- Land Use follow-up (see Section 13.16); and
- Social follow-up (see Section 13.17).
- Human Health (see Section 13.19)

Additionally, specific Follow-up programs have been proposed to verify the effectiveness of the mitigation measures presented in Section 6.21.5, and determine the extent of positive and negative residual effects to Indigenous peoples presented in Section 6.21.6. To date, there have been three proposed Follow-up programs for the economic effects of the Project, which will be

developed following consultation with Indigenous communities. These proposed programs include:

- Indigenous employment during site preparations and construction, operations, and closure phases of the Project, as well as any employment during the care and control phase of the post-closure phase; and
- Indigenous business opportunities during site preparations and construction, operations, and closure phases of the Project.

13.21.1 Reporting

All of the applicable Follow-up programs that encompass effects to Indigenous peoples from the Project will be reported either to required government agencies as part of regulatory reporting, or within the Annual Follow-up program report that will be provided to government agencies, Indigenous peoples and stakeholders.

13.22 Summary

A summary monitoring table has been provided below that summarizes monitoring elements of the Follow-up programs (Table 13.22-1). These monitoring programs have been developed to help verify the effects assessment of the EIS and confirm the effectiveness of the avoidance and mitigation measures proposed. It should be noted that Treasury Metals is aware that regulatory monitoring will be required by government agencies upon EA approval (i.e. ECA monitoring); however, these monitoring programs have not yet been developed and are not included in the summary of EIS monitoring table.

Table 13.22-1: Summary of the EA Monitoring Programs

Discipline	Parameter	Monitoring Method	Project Phases	Location
Terrain and Soils	WRSA Height	Visual from Thunder Lake	Operations Closure	Select locations on Thunder Lake
	WRSA Elevation	Survey the elevation of the WRSA	Operations Closure	WRSA
Geology and Geochemistry	Metals (dissolved) In-situ field parameters Major ions (anions and cations)	Water samples will be taken from a safe location starting as the pit is filling with water.	Post-Closure	Open pit / pit lake
Noise and Vibration (Ambient Noise)	A-weighted equivalent noise levels (L_{eq} in dBA)	72-hour summer monitoring campaigns	Site preparation and construction Operations Closure	Selected sensitive receptors (receptors along east Thunder Lake Road and along Tree Nursery Road)
Noise and Vibration (Wildlife Noise)	A-weighted equivalent noise levels (L_{eq} in dBA)	A series of 1-hour measurements at varying distance from the site	Site preparation and construction Operations Closure	Varying locations around and outside the operations area

Table 13.22-1: Summary of the EA Monitoring Programs (continued)

Discipline	Parameter	Monitoring Method	Project Phases	Location
Noise and Vibration (Blasting)	Peak sound Pressure (dBA) Peak particle velocity (cm/s)	Measurements taken during blasting events in pit 1	Operations (when open pit mining activities are in pit 1 and relatively close to the surface)	Selected sensitive receptors along east Thunder Lake Road
Light	Configuration of artificial lighting	To be conducted when new artificial lighting is installed at the Project site	Site-preparation and construction Operations Closure	Within the operations area
Air Quality (continuous)	24-hour TSP Annual TSP 24-hour PM ₁₀ 24-hour PM _{2.5} 1-hour NO ₂ 24-hour NO ₂	Continuous air sampler will be used that is capable of measuring the require parameters	Site preparation and construction Operations Closure	At the security gate south of the Project
Air Quality (passive)	1-hour NO ₂ 1-hour SO ₂	Passive sampling	Site preparation and construction Operations Closure	West of the Project on Thunder Lake Road and east of the Project on Normans Road
Climate (meteorological)	Precipitation Wind speed / direction Temperature Evaporation	Continuous monitoring at a meteorological station	Site preparation and construction Operations Closure	Undetermined
Climate	GHG emissions (t/year)	Annual calculation based on fuel and gas consumption	Site preparation and construction Operations Closure	Operations area
Surface Water Quality	Metals (dissolved) Cyanide Major ions (anions and cations) In-situ field parameters	Surface water samples will be taken using industry approved methods	Site preparation and construction Operations Closure Post-closure	Watercourse that have the potential to have surface water quality effects from the Project (see Figure 13.8.2-1)
	Discharge (m/s) Channel geomorphology	Flow measurements will be taken using industry approved methods	Site preparation and construction Operations Closure Post-closure	Blackwater Creek Thunder Lake Tributaries 2 and 3 Little Creek and Hoffstrom's Bay Tributary
Groundwater Quality	Metals (dissolved) Cyanide Major ions (anions and cations) In-situ field parameters	Samples will be taken following water level measurements four times a year	Site preparation and construction Operations Closure Post-closure	The monitoring wells described in Section 13.10
	Groundwater elevation	Manual water level measurements on a monthly basis, until continuous pressure transducers are installed,	Site preparation and construction Operations Closure Post-closure	The monitoring wells described in Section 13.10

Table 13.22-1: Summary of the EA Monitoring Programs (continued)

Discipline	Parameter	Monitoring Method	Project Phases	Location
		for once a day measurements with barometric loggers for barometric effects correction		
Wildlife and Wildlife Habitat	# of ha of direct habitat loss or disturbed	Assess the amount of habitat that has been overprinted as a result of the Project	Site preparation and construction Operations Closure	Operations area
	Wildlife mortality	Make a log entry anytime wildlife is struck by equipment on site	Site preparation and construction Operations Closure	Operations area
Wildlife and Wildlife Habitat (cont'd)	SAR species habitat compensation and utilization	Assess whether the SAR habitat compensation area is being used by SAR species	Site preparation and construction Operations Closure Post-closure	Operations area
Fish and Fish Habitat	Fish species composition	Assess the fish species composition	Site preparation and construction Operations Closure Post-closure	Blackwater Creek Thunder Lake Tributaries 2 and 3 Little Creek and Hoffstrom's Bay Tributary
		Assess the fish species composition in the habitat offset location	Operations (once the offset habitat is completed until the DFO determines it is adequate)	Fish habitat offset location
	Sub-lethal toxicity / Acute toxicity test	Use industry standard methods for testing	Site preparation and construction Operations Closure	Water from end of pipe effluent
Wetlands	Wetland extent	Mapping of wetland extent in 5-year intervals	Site preparation and construction Operations Closure	Wetlands within the drawdown zone
	Water level monitoring	Water level collected using water level loggers and barometric pressure loggers	Site preparation and construction Operations Closure Post-closure	Wetlands within the drawdown zone
Vegetation	Monitor dust deposition on plant surfaces		Site preparation and construction Operations Closure	Varying locations around the Project site
	Wetland flora composition	Conduct wetland flora species surveys every 5 years	Site preparation and construction Operations Closure	Wetlands within the drawdown zone

Table 13.22-1: Summary of the EA Monitoring Programs (continued)

Discipline	Parameter	Monitoring Method	Project Phases	Location
Social	In-migration / outmigration of employees	To be tracked annually through Company human resource records	Site preparation and construction Operations Closure	TBD upon consultation with Indigenous communities, government agencies and stakeholders
	Local hiring	To be tracked annually through Company human resource records	Site preparation and construction Operations Closure	RSA
Social (cont'd)	Training	To be tracked annually through Company human resource records	Operations	RSA
	House availability	To be tracked annually with community assistance	Operations	TBD upon consultation with Indigenous communities, government agencies and stakeholders
	Real estate values	To be tracked annually based on community / realtor assistance	Operations	TBD upon consultation with Indigenous communities, government agencies and stakeholders
	Crime	To be tracked annually from publically available police records	TBD upon consultation with Indigenous communities, government agencies and stakeholders	TBD upon consultation with Indigenous communities, government agencies and stakeholders
	Emergency services	To be tracked annually based on Company health and safety records	Site preparation and construction Operations Closure	RSA
	Traffic accidents	To be tracked annually based on Company health and safety records	Site preparation and construction Operations Closure	TBD upon consultation with Indigenous communities, government agencies and stakeholders
Economic	Employment	To be tracked annually through Company human resource records	Site preparation and construction Operations Closure	RSA
	Business and contracting opportunities	To be tracked annually through Company procurement records	Site preparation and construction Operations Closure	RSA

Table 13.22-1: Summary of the EA Monitoring Programs (continued)

Discipline	Parameter	Monitoring Method	Project Phases	Location
	Training courses	To be tracked annually through Company human resource records	Operations	RSA
	Worker profile	To be tracked annually through Company human resource records	TBD upon consultation with Indigenous communities, government agencies and stakeholders	TBD upon consultation with Indigenous communities, government agencies and stakeholders
Economic (cont'd)	Economic commitments	To be tracked annually based on Company human resource and business procurement records	Site preparation and construction Operations Closure	RSA
Indigenous	Indigenous employment during operations	To be tracked annually through Company human resource records	Operations	Potentially affected communities
		To be tracked annually through Company human resource records	Closure	Potentially affected communities
		To be tracked annually through Company human resource records	Post-closure	Potentially affected communities