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6.8 Springpole Lake, Southeast Arm System

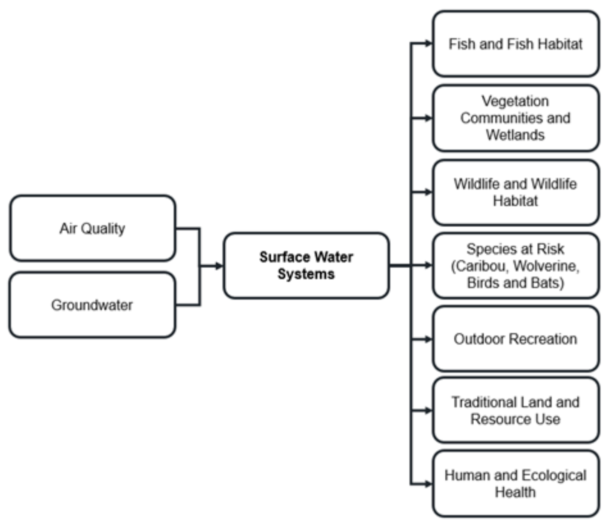
Surface water is selected as a valued component (VC) because it is critical to the life function of human and non-human biota, supports Indigenous, commercial and recreational uses, and provides cultural value to humans. The surface water VCs encompass aspects related to surface water, including hydrology (surface water volumes and flows) as well as surface water quality.

The mine site is situated between two lakes: Birch Lake and Springpole Lake (Figure 6.6-1). Springpole Lake is part of the Birch Lake watershed. At a regional scale, Springpole Lake flows through its southeast arm to the Birch River, towards Lake St. Joseph, approximately 150 kilometres (km) downstream to the south of the mine site. The effects assessment for surface water is divided into the following VCs, shown in Figure 6.6-1, based on the potential for effects:

- Birch Lake system (Section 6.6);
- Springpole Lake, north basin system (Section 6.7);
- Springpole Lake, southeast arm system (this section); and
- Local inland waterbody systems (Section 6.9).

In the absence of mitigation, the assessment of potential changes in surface water is directly linked to other VCs, and is informed by the following sections:

- **Air Quality (Section 6.2):** The assessment of the potential effects on air quality includes changes in dust deposition during construction and operation of the Springpole Gold Project (Project) that may affect surface water quality.
- **Groundwater (Section 6.5):** The assessment of the potential effects on groundwater includes changes in groundwater quantity and quality during construction, operation and closure of the Project that may affect surface water quantity and quality.



In addition, the assessment of potential changes in surface water systems is also directly linked to other VCs, and informs the analysis of the following sections:

- **Fish and Fish Habitat (Section 6.10):** The assessment of the potential effects on fish and fish habitat is informed by the changes in surface water quantity and quality during construction, operation and closure of the Project.
- **Vegetation Communities and Wetlands (Section 6.11):** The assessment of the potential effects on vegetation communities and wetlands is informed by surface water quantity and quality during construction, operation and closure of the Project
- **Wildlife and Wildlife Habitat (Section 6.12):** The assessment of the potential effects on wildlife and wildlife habitat is informed by surface water quantity and quality during construction, operation and closure of the Project.

- **Species at Risk (Section 6.13 to Section 6.16):** The assessment of potential effects on species at risk is informed by the potential to change surface water quantity and quality during construction, operation and closure of the Project as this may affect species at risk habitat.
- **Outdoor Recreation (Section 6.18):** The assessment of potential effects on outdoor recreation is informed by the potential changes in water quantity during construction and operation of the Project as this may affect navigation.
- **Traditional Land and Resource Use (Section 6.21):** The assessment of potential effects on traditional land and resource use is informed by the potential changes in water quantity during construction and operation of the Project as this may affect the ability to access lands and resources used by Indigenous people.
- **Human and Ecological Health (Section 6.24):** The assessment of potential changes in human and ecological health is informed by the potential changes in water quality during construction and operation of the Project, which may affect human and ecological health through surface water consumption.

The assessment of the potential changes in surface water systems from the Project are compared to relevant federal and provincial criteria (Section 6.6.1.4). The assessment is informed by:

- Groundwater technical support documentation, including the Baseline Hydrogeology Report (Appendix L-1) and the Hydrogeological Model Report (Appendix L-2);
- Hydrology technical support documentation. including the Baseline Hydrology Report (Appendix M-1), the Mine Site Water Balance Report (Appendix M-2) and the Receiver Water Balance Report (Appendix M-3); and,
- Surface water quality technical support documentation including the Baseline Surface Water Quality Report (Appendix N-1), the Surface Water Quality Model Report (Appendix N-2), and the Predictive Modelling of Open Pit Basin Water Quality (Appendix N-3).

6.8.1 Assessment Approach

The approach to the assessment of potential changes to surface water systems includes a description of the relevant regulatory and policy setting, a description of the input obtained through consultation specific to this VC, the identification of criteria and indicators along with the associated rationale, a description of the spatial and temporal boundaries used for this VC along with a description of the attributes used to determine the significance of any residual, adverse effects. The assessment of potential effects is supported by a description of the existing conditions for the VC (Section 6.8.2), the identification and description of applicable pathways of potential effects on the VC (Section 6.8.3) and a description of applicable mitigation measures for the VC (Section 6.8.4). An outline of the analytical methodology conducted for the assessment and the key assumptions and/or conservative approach is found in Section 6.8.5. With the application of mitigation measures to the potential effects on the VC, the residual effects are then characterized in Section 6.8.6 and the significance of the residual effects is determined in Section 6.8.7.

6.8.1.1 Regulatory and Policy Setting

The effects assessment for surface water systems has been prepared in accordance with the requirements of the federal Environmental Impact Statement (EIS) Guidelines (Appendix B-1) and the provincial approved Amended Terms of Reference (ToR; Appendix B-3). Concordance tables, indicating where EIS Guidelines and ToR requirements have been addressed, are provided in Appendix B-2 and B-5, respectively.

As the Project is located in the province of Ontario, it will need to meet applicable federal and provincial legislation and regulatory requirements; further information regarding anticipated approval requirements is provided in Section 11. Government policies, objectives, standards or guidelines most relevant to the VC are summarized below.

Fisheries Act

The responsibility for the management of fisheries resources in Canada under the *Fisheries Act* (R.S.C., 1985, c. F-14) is administered primarily by Fisheries and Oceans Canada (DFO). The pollution prevention provisions of the *Fisheries Act* (Section 36) are administered by Environment and Climate Change Canada (ECCC).

Metal and Diamond Mining Effluent Regulations

The Metal and Diamond Mining Effluent Regulations (MDMER; SOR/2002-222), developed under Section 36 of the *Fisheries Act* regulate the deposit of mine effluent into natural waters frequented by fish. To remain in compliance with the *Fisheries Act*, Schedule 4 of the regulations provides the maximum allowable concentrations of identified parameters (pH, total suspended solids, arsenic, copper, lead, nickel, zinc, radium-226, cyanide) in effluents from mining operations. In addition, environmental effects monitoring requirements for mining operations are specified in Schedule 5 of the MDMER.

Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life

The Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life are established by the Canadian Council of Ministers of the Environment (CCME 2017). These guidelines are developed collaboratively among provincial, territorial and federal jurisdictions and regularly updated to reflect current toxicology information and guideline derivation approaches. Water quality guidelines for the protection of aquatic life are parameter-specific and are designed to safeguard the most sensitive life stage of the most sensitive aquatic species for periods of indefinite exposure. These guidelines are grounded in rigorous peer-reviewed scientific research and are derived from toxicological data across a range of species and environmental conditions. To account for uncertainties, such as interspecies and environmental variability, most guidelines additionally have conservative safety factors applied, providing a high level of protection for aquatic ecosystems.

Mining Act

The *Mining Act* (R.S.O. 1990, c. M.14), as amended by the *Building More Mines Act, 2023* (S.O. 2023, c. 6 - Bill 71), and Ontario Regulation (O. Reg.) 35/24: Rehabilitation of Lands sets out standards and criteria for mine closure. Specifically, with respect to surface waters, these statutes and regulations identify surface water quality parameters to be monitored from mines, as well as monitoring and certification requirements for assessing the success of closure activities in protecting surface waters from potential mining effects. Additionally, these statutes and regulations provide guidance regarding progressive rehabilitation to accelerate mine site rehabilitation in advance of close out activities. The monitoring requirements during closure for the Project related to surface water will be developed to meet the requirements under O. Reg. 35/24.

Environmental Protection Act

The *Environmental Protection Act* (R.S.O. 1990, c. E.19) is the principal pollution control statute in Ontario and is used in conjunction with the *Ontario Water Resources Act* (OWRA; R.S.O. 1990, c. O.40) to manage development activity that may affect water quality. The *Environmental Protection Act* contains general provisions that can be used to protect surface water and groundwater quality.

***Ontario Water Resources Act* and Related Regulations**

The OWRA is the principal statute governing water quality and quantity in Ontario. It is a general management statute that applies to groundwater and surface water. Administered by the Ministry of the Environment, Conservation and Parks (MECP), the OWRA contains several important regulations that protect water resources, including:

- O. Reg. 387/04: Water Taking and Transfer Regulation, which requires a permit for water takings of more than a total of 50,000 litres per day (L/d) (with some exceptions). Section 34 of the OWRA requires the proponent to obtain a Permit to Take Water, and Section 9 of O. Reg. 387/04 requires all permit holders to collect, record and report data on daily volumes of water withdrawals.
- Section 53 of the OWRA requires that an Environmental Compliance Approval be obtained for industrial sewage systems that release or discharge, store, or transport contaminants to groundwater or surface water.

Provincial Water Quality Objectives

The Provincial Water Quality Objectives developed by the MECP through its responsibilities under the OWRA and *Environmental Protection Act*, along with management policies and guidelines, were developed for the protection of aquatic life and recreational uses; they are numerical and narrative ambient surface water quality criteria that represent a desirable level of surface water quality. Similar to the Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, Provincial Water Quality Objectives for the protection of aquatic life are intended to be protective of all forms of aquatic life and all aspects of the aquatic life cycle during an indefinite exposure to the water.

MECP Policy *B-1-5 Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters* (MECP 2016) describes the procedures to establish receiving-water based effluent requirements for point source discharges to surface waterbodies.

6.8.1.2 Influence of Consultation with Indigenous Communities, Government and the Public

Consultation has been ongoing for several years, prior to and throughout the environmental assessment process, and will continue with Indigenous communities, government agencies and the public through the life of the Project. Section 2 provides more detail on the consultation process. The Record of Consultation (Appendix D) includes detailed comments received, and responses provided, during the development of the final Environmental Impact Statement / Environmental Assessment (EIS/EA).

Feedback received through consultation has been addressed through direct responses (in writing and follow-up meetings) and incorporated in the final EIS/EA, as appropriate. General comments on water quality and quantity for Birch Lake, Springpole Lake and local inland waterbodies are included in Section 6.6.1.2. The key comments that influenced the assessment for surface water of the southeast arm between the draft and final EIS/EA are provided below.

Baseline Water Levels and Flows in Springpole Lake

The MECP requested further information on the characterization of baseline water level in Springpole Lake, and how the Project may affect water levels in comparison to natural variation. Hydrometric baseline data have continued to be collected since the draft EIS/EA to appropriately characterize baseline flow and water level conditions in Springpole Lake and are sufficient to determine natural variation. Water levels throughout Springpole Lake have been measure over the period between May 2021 to Oct 2022 and confirm that lake levels are consistent the entire lake. There has been more than two years of flow measurements conducted during three monitoring programs (2011 to 2012, 2020, 2021 to 2022) which validate the selection of Water Survey of Canada station Sturgeon River at McDougall Mills as an appropriate reference station. In addition, a robust rating curve for the outlet of Springpole Lake has been developed and is used to determine natural variability in Springpole Lake levels. This information has been included in the Baseline Hydrology Report (Appendix M-1, Section 4.8).

Low Flow Conditions

The MECP requested further consideration for alternate methods to calculate the low flow condition, and to revise the calculation based on the smaller catchment area due to temporary dewatering of the open pit basin. The application of a 7-day average low flow over a 20-year period (7Q20) analysis to a lake system, as was done for the riverine sections has been reevaluated for the Baseline Hydrology Report (Appendix M-1, Section 4.7). A review of methods to calculate the low flow condition is included in the analysis, and the most conservative method has been applied at riverine sections. Further, the 7Q20 analysis at the southeast arm of Springpole Lake has been estimated using regression analyses, to account for the reduced catchment area due to the temporary dewatering of a portion of the north basin of Springpole Lake.

Rating Curve

The MECP requested that the rating curve representative of the inlet of Springpole Lake be presented in the final EIS/EA. The Baseline Hydrology Report (Appendix M-1, Section 4.8) includes the rating curves for Springpole Lake.

Modelled Parameter of Concern

Slate Falls Nation requested clarification on the destruction of cyanide throughout the entire water management system. As discussed in Section 5.12.5, the in-plant effluent treatment using sulphur dioxide / air will be used to destroy cyanide and to precipitate metals in the process plant tailings effluent before it is discharged to the co-disposal facility (CDF). This is the standard proven technology used to treat gold mine tailings effluents at most mines in Ontario. The treated effluent will be discharged to the CDF, and the CDF will generally be operated as a closed loop system. Excess waters collected in the central water storage pond will be treated in an effluent treatment plant (ETP) before being released to the environment. The ETP will be designed and operated to produce an effluent quality appropriate for discharge to the environment in accordance with applicable regulatory requirements, including for cyanide species. The fully treated effluent will be confirmed to meet all applicable regulatory discharge criteria before being released to the environment at the final discharge location in the southeast arm of Springpole Lake. A rigorous monitoring program will be in place to assess whether effluent and receiver water quality is maintained (Section 12.5). The potential effects of discharging treated effluent are discussed in Section 6.8.6.2 and based the results of the Surface Water Quality Modelling Report (Appendix N-2), which includes cyanide (total and weak acid dissociable) as modelled parameters.

Slate Falls Nation requested further information on how nitrate was assessed. Nitrogen species (nitrite, nitrate, ammonia) have been added to the predictive Surface Water Quality Modelling Report (Appendix N-2). The predicted concentrations of nitrite, nitrate and ammonia inform the effects assessment for surface water VCs (Section 6.6 through 6.9) and aquatic resources (Section 6.10). Effluent discharged from site will be protective of aquatic life and must adhere to all provincial and federal requirements, including the MDMER. This includes that effluent quality must be below MDMER effluent criteria for un-ionized ammonia, and meet applicable provincial requirements, prior to discharge into the receiving environment.

The MECP requested the inclusion of ammonia as a parameter of concern in the assimilative capacity assessment. Ammonia has been included in the surface water quality model (Appendix N-2, Section 3.3) and the assessment of potential effects on the water quality of southeast arm of Springpole Lake (Table 6.6-5).

Assimilative Capacity Modelling

Slate Falls Nation requested clarification on the maximum dilution and mixing zone predicted from the CORMIX model. The CORMIX model has been revised and includes additional clarification regarding the calculation of effluent strength and estimation of potential effluent limits (Appendix N-2, Attachment 1, Section 3).

The MECP requested clarification of the evaluation approach of treated effluent discharge mixing zone and assimilative capacity, for the worst-case scenario where discharge occurs with the maximum rated capacity of the ETP daily when the receiver is experiencing the 7Q20. In addition, it was noted that the overprinting of the upper portion of the watershed by the Project site was not accounted for in the evaluation. Discharge of treated effluent from the Project will be protective of the receiving environment and will occur in accordance with federal and provincial approval requirements. The assimilative capacity assessment, including CORMIX modelling, considered multiple sensitivity scenarios to estimate the likely maximum extent of the mixing zone. As water management planning and associated engineering advances, the final maximum extent of the mixing zone and final effluent criteria for the Project will be refined as part of the environmental approvals phase and will follow the procedure outlined in Policy B-1-5 (MECP 2016). The Surface Water Quality Modelling Report (Appendix N-2, Section 3.4.2) includes a revised watershed area to account for the smaller watershed due to overprinting of the Project.

Mixing Zone for the Treated Effluent Discharge

Mishkeegogamang Ojibway Nation requested further information on the assessment of the mixing zone. The assessment of the mixing zone is described in the Treated Effluent Discharge Mixing Study (CORMIX; Appendix N-2, Attachment 1).

The MECP requested clarification for the mixing zone for the treated effluent discharge location given the predicted parameter values. The Project discharge will be protective of the receiving environment and will occur in accordance with federal and provincial approval requirements. The Treated Effluent Discharge Mixing Study (CORMIX; Appendix N-2, Attachment 1) has been updated and indicates that effluent concentrations will meet benchmarks by the end of the mixing zone. The final effluent criteria for the Project will be determined in consultation with the MECP during the environmental approvals phase.

The MECP requested a sensitivity analysis on the density of the treated effluent to better understand the how the mixing zone may be affected. Due to the rapid mixing characteristics of the discharge location, it is not likely to be a notable impact on the estimated extent of the mixing zone; however a high-level sensitivity analysis on effluent density has been carried out and presented in the Surface Water Quality Modelling Report (Appendix N-2, Section 4.3).

Ongoing Engagement

The Northwestern Ontario Métis Community expressed interest in participating in the environmental approvals phase related to the treated effluent discharge, and the development and implementation of a monitoring program to verify the accuracy of predicted effects. Section 12.5 provides a description of the monitoring program to evaluate the predicted effects and effectiveness of the mitigation measures and, along with the extensive surface water quality monitoring program in place currently, will form the basis for monitoring programs refined during the permitting phase. First Mining Gold Corp. will continue to keep

Northwestern Ontario Métis Community informed of the permitting timelines and any changes as the Project progresses.

6.8.1.3 Spatial and Temporal Boundaries

The Project Development Area (PDA) is defined as the footprint of the Project including the mine site area, mine site access road and the transmission line corridor, as well as a buffer in order to allow flexibility for design optimizations. The buffer includes approximately 250 metres (m) around the mine site area. The buffer for the transmission line is included within the 40 m wide corridor and within the 30 m wide corridor for the mine access road. Where the mine access road and transmission line are aligned together, the buffer is included within a 60 m wide corridor.

The spatial boundaries used for the assessment of surface water of the southeast arm are shown in Figure 6.6-3 and defined as follows:

- **Local Study Area (LSA)**: The LSA for surface water extends from the PDA to include the waterbodies and watercourses potentially affected by changes in hydrology and surface water that may result in a potential effect on surface water quality and quantity. The area is bounded by:
  - Springpole Lake watershed, from the outflow of Cromarty Lake to 1 km downstream of the Birch River crossing at the Wenasaga Road;
  - Northeastern shoreline of Birch Lake, to the north and northeast of the PDA; and
  - A distance of 3 km downstream of the PDA within Birch Lake, to the west.
- **Regional Study Area (RSA):** The RSA for surface water systems encompasses the LSA, as well as the contributing sources of water in the Birch Lake watershed. This also extends downstream to the confluence of the Birch River with Gull Lake, approximately 8 km downstream of the LSA.

From a surface water perspective, the construction of the transmission line is expected to occur during frozen conditions or will occur within a small area for a very short period of time and on land. Therefore, there are no expected effects on the surface water VC due to the construction and operation of the transmission line. As a result, potential for effects on surface water is limited to the mine site and the mine access road area of the PDA.

The temporal boundaries for the assessment of surface water systems are defined as:

- **Construction Phase:** Years -3 to -1, representing the construction period for the Project.
- **Operations Phase:** Years 1 to 10, with the first year potentially representing a partial year as the Project transitions from construction into operations. Mining of the ore from the open pit will end in Year 10, at which time the pit will begin refilling with water.
- **Decommissioning and Closure Phase:**
  - Active Closure: Years 11 and 15, when final decommissioning and the majority of active reclamation activities are carried out; and
  - Post-closure: Years 16+, corresponding to the post-closure monitoring period and when the filled open pit basin will be reconnected to Springpole Lake.

Effects on the VC are assessed for each Project phase (i.e., construction, operations and closure).

6.8.1.4 Criteria and Indicators

In undertaking the assessment of surface water in the southeast arm, the following criteria were used:

- Change in water quantity; and
- Change in water quality.

The specific criteria, measurable indicators and the rationale for the selection of criteria are described in Table 6.8-1.

6.8.1.5 Description of Residual Effect Attributes

The residual effects for surface water in the southeast arm are characterized in terms of the following attributes:

- Magnitude;
- Geographic extent;
- Duration;
- Frequency; and
- Reversibility.

These attributes along with the rankings are further described in Table 6.8-2.

In addition, the residual effects for surface water are characterized according to the ecological and/or social context within which the VC is found. This is a qualitative measure of the sensitivity and/or resilience of the VC is to potential change. The following ranking is applicable:

- **Level I:** The VC may or may not be sensitive but is capable of supporting the predicted change with typical mitigation measures.
- **Level II:** The VC is sensitive and requires special measures to support the predicted change.
- **Level III:** The VC is sensitive and unable to support the predicted change even with special measures.

As noted in Section 6.1, a residual effect is defined as significant if both of the following criteria are satisfied:

- A Level II or III rating is attained for all of the attributes involving magnitude, extent, duration, frequency and reversibility; and
- A Level II or III rating is attained for ecological and/or social context.

Conversely, if a Level I rating is achieved for any of the attributes involving magnitude, extent, duration, frequency or reversibility, or if a Level I rating is achieved for the ecological and/or social context, then the residual effect is considered to be not significant.

In the event there is a significant adverse effect, the likelihood of occurrence is further described.

6.8.2 Existing Conditions

A description of the baseline conditions is presented below to characterize the existing conditions for surface water and is based on several years of study that has resulted in a comprehensive surface water dataset for this stage of Project planning. The existing conditions are used to support the assessment of potential effects from the Project on surface water and will support long-term monitoring for the Project.

Additional baseline information on surface water can be found in the technical support documentation including the Baseline Hydrology Report (Appendix M-1) and Baseline Surface Water Quality Report (Appendix N-1).

The surface water monitoring stations are shown in Figure 6.6-1 and the hydrometric stations for the Project are shown in Figure 6.6-2. In 2022, the baseline monitoring program was expanded to include three additional regional sampling locations downstream the southeast arm of Springpole Lake in response to feedback received from Indigenous communities (Figure 6.8-1). Meteorological data collected from the Project site have been supplemented with regional ECCC data with longer records. Climate data collected at the Project site weather stations were compared to the data from the regional climate stations, and similar trends were observed in precipitation, temperature and evaporation rates. The results of this analysis indicated that ECCC Ear Falls and Red Lake stations were the most suitable reference stations for Springpole Lake and the Project site. Red Lake station was selected due its location and period of record.

6.8.2.1 Surface Water Quantity

Springpole Lake has a large, generally circular, north basin (Section 6.7) connected to the long, narrow southeast arm of Springpole Lake by a narrow channel (referred to as the southeast arm). The southeast arm is 17.7 km long and much of that length is a narrow channel bound by a steep bedrock wall along the north shore. The more open areas of the southeast arm extend to the south where the slope of the topography is gentler. There is also a deep portion in the southeast arm, reaching 26 m in depth, located approximately 10 km east of the confluence with the north basin of Springpole Lake. The catchment area reporting to the inflow of Springpole Lake via Cromarty Lake is approximately 1,274 square kilometers (km^2), while the catchment area reporting to the outflow is 1,372 km^2.

Eight water level monitoring stations were established in Springpole Lake in 2020 which measured water levels between mid-June and mid-September. Data from these stations show that water levels across Springpole Lake, including the north basin and southeast arm, are equal and controlled by the lake outflow into Gull Lake via the Birch River. Water level monitoring confirms this understanding, with no difference in hydraulic head observed across the lake level monitoring stations under all observed water levels and flow conditions (Appendix M-1). Water levels in Springpole Lake are generally highest in June and July and drop approximately 0.4 to 0.6 m in the late summer or early fall. The lowest water levels were observed at the end of the monitoring period (mid-October) at approximately 391.0 metres above sea mean level (m amsl).

A comprehensive record of flow through Springpole Lake has been captured by flow monitoring stations established at its inflow (from Cromarty Lake) and outflow (into Gull Lake). Annualized monthly flow statistics for the outlet of Springpole Lake are presented in Table 6.8-3 and rating curves for Springpole Lake are presented in Figure 6.8-2 and Appendix M-1. Flows in Springpole Lake tend to peak in early June, and trend downward over the course of the summer and fall. Flows tend to reach a minimum and remain consistent from January to early April. Average monthly flows are expected to be highest in May (21.4 cubic metres per second [m^3/s]) and June (22.1 m^3/s), following the spring freshet, and lowest during the late winter months of February (5.9 m^3/s) and March (5.2 m^3/s). These values were determined by prorating flows from long-term flow records for nearby Water Survey of Canada station Sturgeon River at McDougall Mills (05QA004), selected to act as a basis for the development of flow statistics for the Project site based on its length and completeness of record, as well as how its historical data fit with the monitoring datasets considered in the baseline studies (Appendix M-1).

Low flow indices for the southeast arm are provided in Table 6.8-4. These include the 7Q2, 7Q5, 7Q10 and 7Q20 low flow conditions, defined as the lowest consecutive 7-day average flow that is expected to occur in a 2-, 5-, 10-, or 20-year return period, respectively. Low flow runoff depths are typically correlated to the watershed size, as smaller watersheds experience lower low flow conditions. For this reason, a regression analysis was carried out to produce the values in Table 6.8-4, resulting in a 7Q20 value for the southeast arm of 1.1 m^3/s.

6.8.2.2 Surface Water Quality

Over 190 water quality samples have been collected from 2011 though 2022 from the southeast arm (Appendix N-1). Analytical results are compared to a consistent set of water quality guidelines for the protection of aquatic life (WQG PAL) listed in Table 6.6-6.

A summary of water quality for the southeast arm is presented in Table 6.8-5; water quality results for each monitoring station (SW-08, SW-07a, SW-16, SW-07, SW-27 and SW-22) are presented in Appendix N-1. Additionally, the baseline sampling program was expanded in 2022 to include additional monitoring downstream of the southeast arm of Springpole Lake at three regional sampling locations (Figure 6.8-1), a total of 37 samples have been collected to date. These additional stations are representative of drainages associated with Cat Lake First Nation and Slate Falls Nation and include:

- RSW-1: Gull Lake, downstream of inputs from Springpole Lake and the Birch River;
- RSW-2: Gull Lake, upstream of RSW 1 / potential changes in surface water from the Project; and
- RSW-3: downstream of RSW-1 and RSW-2, upstream of Slate Falls Nation Reserve.

The results indicate that the southeast arm is typical of oligotrophic lakes in northwestern Ontario, with very low levels of total suspended solids, total dissolved solids and turbidity, and circumneutral pH (ranging pH 6.3 to pH 7.5). Concentrations of total and dissolved metals in the southeast arm are low, and are consistently below WQG PAL. Overall, there are few occasions where measured baseline concentrations are outside the range of available water quality guidelines during the sampling period, predominately for pH and phosphorus (Table 6.6-6).

Overall, the number of samples having natural water quality above water quality guidelines are of low frequency (less than 3 percent [%]) and are considered representative of the natural heterogeneity of the southeast arm.

Additional discussion of baseline concentrations of phosphorus and mercury are provided below. These parameters correspond to identified parameters of interest for the southeast arm based on the following:

- Exceedance of WQG PAL in baseline conditions (phosphorus). Note, parameters with a single instance of results above guidelines across the entire sampling period (2011 through 2022; Appendix N-1) were not considered to be a parameter of interest for the southeast arm for the purposes of this summary discussion. This is true for pH where single instance wherein pH at SW-16 was 6.32 pH units (September 27, 2019), which is below the WQG PAL value of 6.5 pH units.
- Parameters identified as important (mercury) during consultation with local Indigenous communities.

Phosphorous concentrations in the southeast arm of Springpole Lake ranged from 0.001 to 0.028 milligrams per litre (mg/L). Phosphorus concentrations were above the WQG PAL value of 0.02 mg/L in six samples over the period of record (or approximately 3%). However, overall, phosphorous concentrations are characterized as very low in the southeast arm as both average and 95th percentile concentrations are less than WQG PAL (Table 6.8-5). The highest measured concentrations of phosphorus are generally associated with elevated total suspended solids, with highest concentrations recorded at station SW-08 in 2011.

Total and dissolved concentrations of mercury have been monitored in the southeast arm of Springpole Lake since 2011, with ultra-low detection of total mercury and methylmercury added to the baseline monitoring program in 2021. Concentrations of total mercury are very low, with 94% of samplings falling below the analytical detection limit of less than 0.000005 mg/L. A single observation was recorded in October 2021 at station SW-16 where mercury concentration of 0.000047 mg/L was greater than the WQG PAL of 0.000026 mg/L (i.e., 1 sample of a total of 227 samples collected in the southeast arm). Otherwise, concentrations of total mercury range from 0.0000025 to 0.000012 mg/L, which is below the WQG PAL criteria. Most detectable concentrations of mercury were associated with station SW-16 over the period of record. Natural aquatic environments contain mercury primarily due to long-range atmospheric transport of gaseous elemental mercury from sources like volcanic activity and industrial emissions, particularly from coal-fired power plants. Mercury is not proposed to be used in the process for gold mining at the Project, and the Project will not be a source of mercury. A description of key metals in host rock and ore is presented in Section 4.3 of Appendix K-1.1 (Static Geochemical Testing Baseline Report) of the EIS/EA. Solid phase mercury concentrations in the Project rock are low. Specifically, mercury concentrations were below qualitative threshold values (10 times crustal abundance) in 98% of the mine rock samples and 94% of the ore-grade samples. The potential for mercury leaching from the rock is also low for materials based on the results of leaching tests (Appendix K-1.1) and humidity cell tests (Appendix K-1.3).

6.8.2.3 Traditional Knowledge

As part of the Project, all eight Indigenous communities were contacted to participate in the EA process, and to provide Traditional Knowledge and Traditional Land Use information. To date, six Indigenous communities—Cat Lake First Nation, Lac Seul First Nation, Mishkeegogamang Ojibway Nation, Slate Falls Nation, Wabauskang First Nation and the Northwestern Ontario Métis Community—have provided Traditional Knowledge and Traditional Land Use information. Specific Traditional Knowledge and Traditional Land Use information relevant to surface water quality and quantity in Birch Lake, Springpole Lake and local inland waterbodies is described in Section 6.6.2.3.

6.8.3 Identification of Pathways to Potential Effects

The initial step in the assessment process is to identify interactions between the Project and the VC that can result in pathways to potential effects. These potential effects may be direct, indirect and/or positive, where applicable. Table 6.8-6 includes the potential interactions of the Project with the surface water of the southeast arm of Springpole Lake, prior to the application of the mitigation measures. The professional judgment of technical experts experienced with mining projects in Ontario and other parts of Canada, as well as input from Indigenous communities, government agencies and the public, informed the identification of those interactions that are likely to result in a pathway to a potential effect due to a measurable change on surface water quantity and quality. These pathways to potential effects are further described below for each phase of the Project, along with the rationale for those interactions excluded from further assessment. Section 6.8.4 and Table 6.8-7 provide a description of the mitigation measures applied to these pathways to during all phases of the Project. The residual effects, after the application of the mitigation measures, are then described and further evaluated in Section 6.8.6 using the criteria and indicators identified in Section 6.8.1.4.

Construction Phase

The construction phase of the Project is expected to occur over a three-year period and will include preparation of the site and the construction of mine infrastructure. The following interactions with the Project result in pathways to potential effects on the surface water of the southeast arm of Springpole Lake as described below. After mitigation is applied to each pathway, as described in Table 6.8-7, the residual effects are assessed using the criteria identified for each pathway:

- The development of temporary construction camp interacts with the surface water of the southeast arm. This activity results in a pathway to a potential effect due to discharge of treated sewage effluent which may affect surface water quality. The assessment of potential effects on surface water includes changes in surface water quality.
- The construction of the effluent pipeline and associated access road, and the development and operation of aggregate sources interacts with the surface water of the southeast arm.
  - These activities result in pathways to potential effects on the surface water of the southeast arm due to the following:
    - Ground disturbances associated with the effluent pipeline and diffuser could lead to erosion and sedimentation which may affect surface water quality.
    - The change in catchment areas around the aggregate sources required to manage contact and non-contact water may affect the quantity of surface water contributing to the southeast arm.
  - The assessment of potential effects on surface water includes changes in surface water quality from these pathways.

During construction, the majority of Project interactions will not geographically overlap with the catchment of the southeast arm and potential effects are unlikely. Site preparation activities of the mine site area are unlikely to interact directly with the southeast arm of Springpole Lake, but are addressed in the assessment of potential effects on the north basin of Springpole Lake (Section 6.7). Similarly, the construction of the dikes is unlikely to interact directly with the southeast arm of Springpole Lake, and is also addressed in the assessment of potential effects on the north basin of Springpole Lake. Dust generated from the construction and use of equipment for the mine access road and effluent pipeline road are sufficiently removed and away from the southeast arm of Springpole Lake. The construction of the transmission line is expected to occur during frozen conditions or will occur within a small area for a very short period of time and occur on land. Therefore, this activity does not interact with surface water of the southeast arm.

There is no plausible interaction between the employment and expenditures activities and the southeast arm of Springpole Lake during any Project phase.

Operations Phase

The operations phase is anticipated over a 10-year period. The following interactions with the Project result in pathways to potential effects on the surface water of the southeast arm of Springpole Lake as described below. After mitigation is applied to each pathway, as described in Table 6.8-7, the residual effects are assessed using the criteria identified for each pathway:

- The operation of the water management and treatment facilities interacts with the surface water of the southeast arm via the treated effluent discharge line location. This activity results in a pathway to a potential effect on the surface water of the southeast arm due to the discharge of treated effluent, which may affect surface water quantity and quality. The assessment of potential effects on surface water of the north basin includes changes in surface water quantity and quality from this pathway.

- The operation of the accommodations complex interacts with the surface water of the southeast arm. This activity results in a pathway to a potential effect on the surface water of the southeast arm due to the discharge of sewage effluent, which may affect surface water quality. The assessment of potential effects on surface water of the north basin (Section 6.7) includes changes in surface water quality from this pathway.

The operation of the open pit mine is unlikely to interact directly with the southeast arm of Springpole Lake but is addressed in the assessment of potential effects on the north basin of Springpole Lake (Section 6.7). The operation of the process plant, CDF, ore stockpiles and overburden stockpile are not expected to have a direct interaction with the surface waters of the southeast arm of Springpole Lake. Dust generated from the operation of equipment on the mine access road and effluent pipeline road are sufficiently removed and away from the southeast arm of Springpole Lake. Progressive reclamation activities will occur predominantly in the mine site area and are unlikely to interact with the southeast arm of Springpole Lake.

Decommissioning and Closure Phase

Activities occurring during the closure phase, which is expected to occur over a five-year period, are similar to those that occur during the construction phase and use similar mining equipment but generally on a smaller scale. The following interactions with the Project result in pathways to potential effects on the surface water of the southeast arm of Springpole Lake as described below. After mitigation is applied to each pathway, as described in Table 6.8-7, the residual effects are assessed using the criteria identified for each pathway:

- The stabilization of disturbed areas during final reclamation, including regrading, placement of an appropriate cover to facilitate revegetation, if needed, and revegetation (active or passive). These activities result in a pathway to a potential effect on the surface water of the southeast arm due to ground disturbances that could lead to erosion and sedimentation which may affect surface water quality. The assessment of potential effects on surface water of the southeast arm includes changes in surface water quality from this pathway.
- The filling of the open pit basin with water during active closure interacts with the surface water of the southeast arm. This activity results in pathways to a potential effect on the surface water of the southeast arm due to the discontinuation of ongoing water management in the open pit that will lead to changes in the groundwater levels that may affect downstream surface water quantity and due to the pumping of water from the north basin into the open pit basin that will result in changes to water levels, which may affect downstream surface water quantity. The assessment of potential effects on the surface water of the southeast arm includes the changes in surface water quantity from these pathways.
- The reconnection of the reclaimed open pit basin to the north basin interacts with the surface water of the southeast arm. This activity results in a pathway to a potential effect on the surface water of the north basin due to the introduction of water from the open pit basin to the north basin that may affect downstream surface water quality. The assessment of potential effects on the surface water of the southeast arm includes the changes in surface water quality from this pathway.

During active closure, the Project's water management system will continue to operate until site runoff, and excess water from the reclaimed open pit basin (Section 6.7), is of acceptable quality to report directly to the receiving environment.

During decommissioning and closure, the removal of assets, demolition of remaining materials, disposal of demolition-related wastes and monitoring are unlikely to have potential effects on the surface water of the southeast arm.

The interaction between the surface water of the southeast arm and potential spills is not a planned activity that would occur within the normal operating conditions. However, the risk of an unplanned spill is fully assessed in Section 9 and includes consideration of the design and operational safeguards to avoid a spill, an assessment of the potential risks to the environment as a result of an unplanned spill, and the contingency and emergency measures that would be put into place in the event that a spill occurs.

6.8.4 Mitigation Measures

Measures to be implemented to avoid or minimize the effects of the Project on the surface water of the southeast arm of Springpole Lake include:

- Implementation of mitigation measures for potential effects on air quality relevant to dust (Section 6.2) including the following:
  - During construction, operations and active closure, a dust management plan will be implemented to identify potential sources of fugitive dusts, outline mitigation measures that will be employed to control dust generation and detail the inspection and record keeping required to demonstrate that fugitive dusts are being effectively managed.
  - Dust emissions from roads and mineral stockpiles will be controlled through the application of water spray and supplemented by dust suppressants, if required.
  - Site roads will be maintained in good condition, with regular inspections and timely maintenance completed to minimize the silt loading on the roads.
  - Vehicle speeds will be limited.
- Implementation of mitigation measures for potential effects on groundwater relevant to surface water (Section 6.5) including the following:
  - The CDF will be located on favourable geologic conditions at the Project site to support long-term stability and effective seepage management.
  - During construction, a geosynthetic clay liner will be installed on the upstream side of the perimeter embankment of the CDF south cell (specifically the south, west and east sides) to mitigate seepage potential during the operation and closure phases.
- Implement mitigation measures for potential effects on surface water (Section 6.6 and 6.7), relevant to the southeast arm including the following:
  - A compact mine site will be developed to limit the areal extent of disturbance and to limit the overall areas of site contact water that requires management.
  - During construction, operation and active closure, an erosion and sediment control (ESC) plan will be implemented to manage runoff water around disturbed areas. The ESC plan will be prepared prior to the construction phase with the purpose of minimizing site erosion and protecting surface water from sedimentation. The ESC plan will provide further details on measures to minimize slope length and grade, ditching and diversion berms, contact water

management ponds, use of natural vegetation buffers runoff controls, and working in and around water such as with the installation of the effluent discharge.

  - During controlled dewatering of the open pit basin, clean water will be pumped over the dikes at a rate consistent with the natural variability of Springpole Lake, while water not suitable for direct discharge will be pumped to the central water storage pond to manage suspended sediments prior to discharge.
  - To reduce the overall volume of water required to refill the open pit basin and support fish habitat development area creation, recontouring of a portion of the north end of the open pit basin will be undertaken during operations.
  - Passive filling with precipitation and groundwater will be supplemented by water transferred from Springpole Lake in a controlled manner to reduce the fill time while maintaining lake water levels in Springpole Lake within the same magnitude and scale as existing conditions natural variation.
  - During filling of the open pit basin, efforts will also be made to minimize water takings during natural periods of low flow to maintain lake levels within the same magnitude and scale as existing conditions of Springpole Lake.

- During operations and active closure, treated effluent will be discharged at a location where sufficient flow exists to reduce the potential for erosion and promote assimilation at the discharge location. A diffuser or other means could be used to encourage greater mixing and attenuation of the effluent plume at the discharge location, if required. Consistent with MECP (2016) Policy B-1-5, the mixing zone size will be minimized to the extent practicable.
- The ETP will be designed and operated to produce an effluent quality appropriate for discharge to the environment in accordance with applicable regulatory requirements, including the MDMER. Best available technologies that are economical achievable will be considered for the ETP to meet protection requirements. The ETP will be refined with ongoing Project planning and engineering design, and as discharge criteria are finalized during the approvals process.
- Domestic sewage will be treated to meet regulatory requirements before discharge to the environment. Note that sewage treatment plant (STP) discharges will be combined with ETP effluent before discharge to the southeast arm, and excess water in the central water storage pond will be treated at the ETP before being discharged to the southeast arm to maintain the site water balance.

During construction, operation and active closure, discharge of treated effluent from the Project to the southeast arm of Springpole Lake will be protective of the receiving environment and will occur in accordance with federal and provincial approval requirements. Consistent with MECP policy, final effluent quality criteria (limits) will be established to achieve WQG PAL in the receiving environment and will be set during the provincial permitting phase. WQG PAL are based on scientific study to specifically safeguard the most sensitive life stages of aquatic species for periods of indefinite exposure. By setting effluent limits at levels to achieve WQG PAL in the receiving environment near the discharge location, the integrity of waterbodies and the health of aquatic life throughout the life of the Project will be protected against mine-related effluent discharge.

The application of mitigation measures for the pathways of potential effects is described in Table 6.8-7.

Mitigation measures described in this section are expected to be effective for their intended purposes given their effective implementation at similar projects.

Monitoring programs will be implemented to verify the accuracy of the predicted effects, assess the effectiveness of the implemented mitigation measures and may be further optimized in response to monitoring data. Monitoring programs are in place for the Project with previous data collection completed.

The ongoing surface water baseline programs are extensive and were developed to address anticipated regulatory requirements for future approvals. However, future monitoring programs may be refined during the provinical approvals process in collaboration with the MECP and other interested parties, and will include adaptive management triggers for fisheries and fish tissues, as appropriate. A preliminary follow-up and monitoring program is provided in Section 12, and is expected to undergo expansion and refinement during the future provinical approvals process.

6.8.5 Analytical Methodology

The assessment of the surface water effects for the southeast arm of Springpole Lake has been completed in accordance with generally and widely accepted assessment methods. The prediction and assessment of effects to surface waters involved the following steps:

1) Determine baseline surface water conditions in the absence of the Project.
2) Identify the key pathways of interaction of the Project on surface water (Section 6.8.3).
3) Identify key indicators of changes to surface water, including water quality parameters and compounds potentially released to surface water from the identified sources.
    - Identify the relevant regulatory surface water standards and criteria and establish the appropriate assessment criteria for a site in Ontario, noting that there may be more than one applicable criterion for some of the parameters.
4) Predict changes to surface water using appropriate surface water modelling methods and established data sources.
5) Compare surface water quality and hydrology modelling outputs to the assessment criteria.

The analytical methodology, including quantitative predictive modelling used to support the assessment of surface water, is described in Section 6.6.5. In summary, the key features of the assessment include the following:

- A quantitative assessment of the change in surface water quality and quantity was completed using predictive water balance and water quality modelling using industry standard modelling software (GoldSim, Microsoft Excel and PitMod) to support the assessment process.
- Water balance and water quality modelling was completed for the construction, operations, pit filling / active closure and post-closure phases, including pit water quality modelling.
- Water balance and water quality modelling includes appropriately defined sensitivity scenarios to support the assessment of Project effects, including a conservative Base Case, extreme wet scenario, extreme dry scenario and a theoretical upper-case seepage loading scenario.

Additionally, as part of the studies to assess surface water effects in the southeast arm of Springpole Lake, the mixing of treated effluent discharge to the southeast arm was evaluated using CORMIX modelling. CORMIX is a computer model used to simulate how discharged water, such as treated effluent, mixes with the water in rivers, lakes or oceans. This is important because it helps to understand how the discharge mixes in the water so that water quality remains safe and meets environmental standards. The use of CORMIX modelling supports the design of effective treatment and discharge systems to minimize environmental effects. CORMIX modelling was carried out to characterize mixing of treated effluent discharge to the southeast arm, which is planned to occur via a diffuser located in the channel downstream of the inflows from Cromarty Lake (Figure 6.8-3). The CORMIX model results indicate that complete hydrodynamic mixing is expected to occur within 100 m downstream of the proposed discharge location (i.e., approximately same as the channel width). Further, assuming maximum discharge on 7Q20 low flow conditions, effluent strength at the point of complete hydrodynamic mixing ranges from 8.1% to 16%, depending on Project phase.

Assessment nodes for the southeast arm are identified in Figure 6.6-10. Assessment nodes are strategically placed in areas where changes to surface water (flow and quality) may be observed as a result of the Project. For the southeast arm of Springpole Lake, these assessment nodes are:

- Discharge Location: approximately 100 m downstream of treated effluent discharge, at the point of full hydrodynamic mixing, as determined by CORMIX modelling (Node 12);
- Approximately 1 km downstream of treated effluent discharge, corresponding to water quality monitoring station SW-07a (Node 9); and
- At the outlet of Springpole Lake system, corresponds to water quality monitoring station SW-22 (Node 9).

The assessment of the potential effects on surface water quality compared model results against relevant provincial and federal surface water quality criteria. Applicable surface water quality criteria for comparing the predicted water quality concentrations are equivalent to WQG PAL; water quality guidelines are as identified in Section 6.6 (Table 6.6-6).

Effluent Limits for Treated Effluent Discharge

Treated effluent will be conveyed via pipeline to the southeast arm of Springpole Lake for discharge at Node 9. Discharge will occur during the construction, operations and active closure phases. The rate of discharge will vary throughout the phases of the Project and has been simulated by the mine site water balance (Appendix M-2). In Ontario, the final effluent limits for any mine discharge to the receiving environment are set during the provincial permitting process. For the purposes of supporting the effects assessment, preliminary effluent limits have been developed in consideration of 7Q20 low flow conditions, in accordance with MECP Policy B-1-5 (Appendix N-2). The 7Q20 low flow conditions refer to the lowest average streamflow that occurs over seven consecutive days and is expected to happen once every 20 years. This measure helps to understand how low the water flow can get during extreme dry periods. Similarly, as per MECP (2016) Policy B-1-5, effluent criteria must be established to achieve WQG PAL, or baseline equivalents, in the receiving environment. WQG PAL are based on peer-reviewed scientific study to specifically safeguard the most sensitive life stages of aquatic species for periods of indefinite exposure. By setting effluent limits at levels to achieve WQG PAL in the receiving environment, the integrity of waterbodies and the health of aquatic life throughout the life of the Project will be protected.

Additionally, the effluent limits and the ETP will be designed to produce an effluent quality appropriate for discharge to the environment in accordance with applicable federal regulatory requirements, including the *Fisheries Act* and the MDMER. A conservative approach has been taken, using the assumption that an ETP will be required to remove metals and suspended solids from the contact water. Effluent treatment will be in addition to the cyanide destruction and metal reduction that will occur within the process plant and the natural physical and chemical processes that will occur within the site ditching and ponds.

The ETP will be designed to produce an effluent quality appropriate for discharge to the environment in accordance with applicable regulatory requirements, including the MDMER, and the effluent concentrations required by the MECP to protect the receiving water and aquatic resources. Best available technologies that are economically achievable will be considered for the ETP to meet protection requirements.

The preliminary ETP considered in the pre-feasibility study was a modular effluent treatment system. Additional engineering has optimized the water treatment concept as follows:

- A biological process will be used based on the moving bed bioreactor concept, where plastic carriers with attached biofilm move freely in the water column and remove contaminants present in the wastewater. The moving bed bioreactor will also be used for cyanide destruction in addition to the in-plant destruction of cyanide in tailings using the sulphur dioxide / oxygen treatment process (Section 5.8.4). The by-products are nitrate, carbon dioxide and associated biomass.
- The treatment process will continue to the removal of metals. Arsenic removal will be achieved by ferrous sulphate and iron co-precipitation principles. This will be followed by sulphide precipitation for further metals removal with the dosing of sodium sulphide. Adjustment of pH will be controlled by dosing acid and caustic to alkaline conditions of 7.5 to 8 as needed.
- The final stage involves flocculation, which includes a mixing tank before feeding to a clarification process. Following clarification, the fully treated effluent will be confirmed to meet all applicable regulatory discharge criteria before being released to the environment at the final discharge location in the southeast arm of Springpole Lake.

Water quality modelling studies and effluent criteria will be expanded upon and refined as part of the provincial approvals process. This may include additional accounting for site-specific conditions, community feedback, available water treatment technologies, toxicity modifying agents such as water hardness, natural chelating agents such as dissolved organic carbon, receiving water species sensitivities, and potentially other factors.

6.8.5.1 Assumptions and the Use of the Conservative Approach

Conservative approaches are defined as those that provide predictions that will tend to be higher than expected, as a means to avoid the underestimation of potential effects from the Project. The assumptions and conservative approach described in Section 6.6.5.4 are also applicable for the effects assessment on surface waters in the southeast arm of Springpole Lake.

A conservative approach has been taken to estimate discharge requirements for the Project (Table 6.8-8). The estimated discharge volume requirements (combined STP and ETP) do not account for storage and were instead modelled as a flow-through system (Appendix M-2). Accounting for storage would allow the site to store water during wetter conditions, in preparation for dry conditions. This has resulted in an overestimation of volume of treated effluent discharged to the southeast arm.

A conservative assessment of available assimilation capacity, specific to the southeast arm, was performed to back-calculate effluent discharge criteria. Specifically, for the Base Case, the maximum allowable concentration of water quality parameters in effluent discharge was calculated using the maximum predicted discharge rate from the ETP (May of the final year of operations: 382 litres per second [L/s] or 0.382 m^3/s) and the minimum predicted monthly average flow rate the southeast arm (March: 5,216 L/s or 5.22 m^3/s). Assimilation capacity was also assessed for an extreme dry condition (7Q20; Appendix N-2). The results of the assimilation capacity study are summarized in Table 6.8-8 and informed water quality model predictions and the residual effects assessment (Section 6.8.6).

6.8.6 Characterization of Potential Residual Effects

Residual effects of the Project on the surface water of the southeast arm were assessed using both quantitative water balance and water quality modelling (Appendix M and Appendix N, respectively) as well as qualitative methods, as discussed below.

6.8.6.1 Change in Surface Water Quantity

The key mitigation measures that will be applied to potential effects on surface water quantity in the southeast arm of Springpole Lake during construction, operations and closure are further described in Table 6.8-7, and include the following:

- During controlled dewatering of the open pit basin, clean water will be pumped over the dikes at a rate consistent with the natural variability of Springpole Lake.
- Passive filling with precipitation and groundwater will be supplemented by water transferred from Springpole Lake in a controlled manner to reduce the fill time while maintaining lake water levels in Springpole Lake within the same magnitude and scale as existing conditions natural variation.

With the implementation of these mitigation measures, the results indicate that potential changes to surface water quantity of the southeast arm are driven by the following activities:

- Discharge of treated effluent from the combined ETP and STP; and
- Changes to local surface water catchment area upstream in Birch Lake and the north basin as a result of mine site development.

Model results indicate that discharge of treated effluent (combined STP and ETP) to the southeast arm is required through all Project phases, with the exception of extreme dry climate conditions (1:100-year dry) during operations (Table 6.8-8). The highest ETP discharge simulated occurs during the construction and active closure phases. Treatment and discharge rate of 2.89 and 3.09 million cubic metres per year (Mm^3/yr) is required during average years for these phases, respectively.

Operational discharge requirements are predicted to be greatest at the end of operations as a result of increased groundwater inflows to the open pit and site runoff as various site features develop. The annual treated discharge to the environment is approximately 1.11 million cubic metres (Mm^3) (annual average rate: 0.035 m^3/s) in an average climate year, and approximately 3.59 Mm^3 (annual average rate: 0.114 m^3/s) in a 1:100 wet year. In a 1:100 dry year, only discharge from the STP is anticipated (a volume of 0.03 Mm^3, or rate of 0.001 m^3/s). Figure 6.8-4 illustrates the monthly discharge to the environment from the ETP throughout operations for four climate scenarios. The monthly discharge follows a seasonal pattern, peaking in July and dropping to zero throughout the winter months (November to April). Operations phase discharge requirements were determined to be less than construction, which is largely driven by the completion of the lake dewatering process in construction and the void losses observed in the CDF during operations. Void losses occur when water is trapped in the voids of tailings and mine rock deposited in the CDF during the operations phase.

During active closure (pit filling), site contact water will continue to be collected, treated and discharged to the southeast arm, excluding water reporting to the open pit. Water reporting to the open pit, including local runoff and groundwater inflows, will be allowed to accumulate to support the pit filling process. As discussed in Section 6.7, filling of the open bit basin will be augmented by transferring surplus water from the north basin, which is predicted to result in a pit filling time between three and five years. During pit filling, annual discharge of treated water to the southeast arm is predicted to be 2.88, 4.49 and 1.38 Mm^3

(annual average rate: 0.091, 0.142 and 0.044 m^3/s) per year under the average, 1:100 wet and 1:100 dry climate year scenarios, respectively.

During construction, the development of water management and Project infrastructure at the mine site (upstream of the southeast arm) will remove approximately 9.4 km^2 of catchment area, which accounts for approximately 0.7% of the natural catchment area reporting to Node 10 (Figure 6.6-10).

Water balance and lake level model results for the southeast arm during construction, operations and active closure (pit filling) are presented in Table 6.8-9 and Table 6.8-10. These models determined that the predicted changes in lake levels and flow rates, accounting for alterations in local catchment areas and upstream activities (including pit filling) and reductions in baseflow associated with open pit dewatering activities, as well as the discharge of treated effluent. Predicted changes to lake levels and annual average flow rates in the southeast arm during construction and operations are negligible (less than or equal to 5%; Table 6.8-9 and Table 6.8-10) and are not expected to be measurably different from baseline conditions. During the pit filling stage, relatively larger effects are predicted, but these are still minor (less than or equal to 10%) and within the range of baseline conditions (Table 6.8-9).

In post-closure, the PDA will return to a near-natural state, surface runoff will report to the north basin of Springpole Lake (Section 6.7) or to Birch Lake (Section 6.6), both of which flow into the southeast arm of Springpole Lake. Once site runoff and open pit basin water quality meets acceptable criteria, the operation of the ETP will cease. If site runoff does not meet acceptable criteria for passive discharge, the active closure phase configuration will be maintained until it does. Once in post-closure, the site will begin passive discharge to the environment. Water reporting to the remaining water retention infrastructure (central water storage pond, refilled open pit basin) will be passively routed overland as it would naturally. Runoff reporting to the CDF seepage collection system will route to either Springpole Lake or Birch Lake based on the pre-development catchments. Water balance and lake level model results for post-closure are presented in Table 6.8-9 and Table 6.8-10; calculated changes are negligible (less than 1%) and will not be distinguishable from existing conditions.

6.8.6.2 Change in Surface Water Quality

The surface water quality effects assessment for the southeast arm of Springpole Lake aims to evaluate the potential impacts of the proposed Project on concentrations of water quality parameters to support the understanding of how Project activities may alter water quality and to assess whether mitigation measures are appropriately designed. For the Springpole Lake, southeast arm system VC, residual effects on surface water quality were identified through quantitative water quality modelling (Section 6.8.5), assessing potential changes in monthly water quality. To evaluate the geographic extent of these changes, model simulations were conducted at strategically selected locations (i.e., model nodes) where interactions between the Project and water quality are most likely to occur (Figure 6.6-10):

- Discharge location: at approximately 100 m downstream of discharge point, at the maximum estimated extent of full hydrodynamic mixing (Node 12);
- Approximately 1 km downstream of treated effluent discharge (Node 9); and
- At the outlet of Springpole Lake, upstream of the Birch River (Node 10).

Surface water quality model results are presented in Table 6.8-11 to Table 6.8-13, Figure 6.8-6 through Figure 6.8-11, and Appendix N-2. As discussed in Section 6.6.5.4, water quality predictions were made based on inflows and did not assume dilution and mixing within the full basin. This conservative approach aims to avoid the underestimation of potential residual effects on water quality.

The key mitigation measures that will be applied to potential effects on surface water quality in the southeast arm of Springpole Lake during construction, operation and closure are further described in Table 6.8-7, and include:

- The ETP will be designed with best available technologies that are economical achievable and operated to produce an effluent quality appropriate for discharge to the environment in accordance with applicable regulatory requirements.
- During construction, operation and active closure, an ESC plan will be implemented to manage runoff water around disturbed areas.

As described in Section 6.7, the predicted water quality for the north basin, which flows into the southeast arm, is below (i.e., better than) WQG PAL for all modelled parameters, with less than a 15% change relative to baseline concentrations for all parameters except ammonia, beryllium and silver (Table 6.8-11, Table 6.8-12 and Table 6.8-13).

During construction and operations, the implementation of effective ESC measures as described in Table 6.8-7 will reduce the potential effects on surface water quality in the southeast arm of Springpole Lake. As a result, the incidences of increased total suspended solids loading to surface waters due to sedimentation will be mitigated, and residual effects on surface water quality in the southeast arm of Springpole Lake due to this pathway is not predicted.

Further, the transmission line is expected to be constructed primarily in the winter, from temporary winter roads that avoid construction during sensitive periods, as much as practicable. The poles used for the transmission line will be located above the high-water mark to avoid in-water works. The maintenance of vegetation within the transmission line corridor will restrict vegetation heights; however, grubbing is not proposed, and riparian vegetation is expected to remain adequate to prevent long-term ground erosion and sedimentation to adjacent waterbodies. As a result, there are no residual effects on surface water quality predicted as a result of the transmission line.

Construction and Operations

With the implementation of the key mitigation measures, the Project will interact with the water quality of the southeast arm of Springpole Lake due to the discharge of treated effluent from the combined ETP and STP.

Model results indicate that after the application of mitigation measures, the primary pathway for surface water quality effects on the southeast arm during construction and operations is the proposed treated effluent discharge. The southeast arm was selected as the preferred discharge location for treated effluent through the comprehensive alternatives assessment (Section 5.20). This channelized section of Springpole Lake has a defined current, much like a river, and was selected as the effluent discharge location as it provides enhanced effluent mixing / attenuation which will be supplemented with the use of a diffuser at the point of discharge, if required.

The geographic extent of the effect of the treated effluent discharge was quantified along the effluent discharge flow path from the point of discharge, through the LSA, to the outlet of the southeast arm into the Birch River. CORMIX modelling was completed to support the effects assessment (Section 6.8.5; Appendix N-2) and indicates that the full hydrodynamic mixing of treated effluent discharge will be achieved by a maximum of 100 m downstream of the discharge point in a worst-case flow condition (7Q20).

Water quality model results for the assessment nodes along the southeast arm are presented in Table 6.8-11, Table 6.8-12 and Table 6.8-13. Model results indicate there are no exceedances of WQG PAL in the southeast arm in any Project phase

In operations, the overall general patterns observed for water quality of the southeast arm of Springpole Lake are related to seasonal water balance and treated effluent discharge. The predicted water quality for the southeast arm is below (i.e., better than) WQG PAL for all modelled parameters and represents less than a 15% change relative to baseline concentrations for most parameters. As would be expected, the highest concentrations are predicted at the discharge node and decrease downstream. Due to the conservative nature of the water quality model, the concentrations decrease downstream from the discharge point to SW-07a and SW-22 only as a result of additional catchment inflows and without consideration for dilution in the standing volume of the basin, natural attenuation, sorption or dispersion, which are not assumed to occur in the model to be conservative. This would be expected to reduce the concentrations of these water quality parameters in situ.

While some parameters were estimated to be increase relative to baseline concentrations in the southeast arm as a result of discharge of treated effluent, all parameters remain well below WQG PAL (Table 6.8-11, Table 6.8-12 and Table 6.8-13).

Closure

During active closure (pit filling) and post-closure, modelling indicates that the Project largely interacts with the water quality of the southeast arm of Springpole Lake through the following:

- **In active closure:** discharge of treated effluent from the combined ETP and STP; and
- **In post-closure:** the re-establishment of the connection between the open pit basin and the north basin of Springpole Lake.

Similar to the predicted water quality in the operations phase, the overall general patterns observed for water quality of the southeast arm of Springpole Lake in active closure are related to seasonal water balance and treated effluent discharge. The predicted water quality for the southeast arm is below (i.e., better than) WQG PAL for all modelled parameters and represents less than a 15% change relative to baseline concentrations for most parameters. As would be expected, the highest concentrations are predicted at the discharge node and decrease downstream.

In post-closure, the collection and treatment of site runoff will cease, and runoff will passively drain to either Birch Lake (Section 6.6) or the north basin (Section 6.7), which flows into the southeast arm. Once site runoff and pit basin quality meets acceptable criteria, the operation of the ETP will cease. If site runoff does not meet acceptable criteria for passive discharge, the active closure phase configuration will be maintained until it does. Once in post-closure, the reclaimed site will begin passive drainage to the environment, which will occur consistent with regulatory requirements including O. Reg. 35/24. Water reporting to the remaining water retention infrastructure (central water storage pond, refilled open pit basin) will be passively routed to Springpole Lake. Runoff reporting to the CDF seepage collection system will route to either Springpole Lake or Birch Lake based on the pre-development catchments. Additionally, in post-closure, once the open pit basin is filled and acceptable water quality is achieved, it will be hydraulically reconnected to the north basin. Model results indicate that predicted concentrations of water quality parameters in the southeast arm are similar to baseline conditions and no parameters are predicted to be greater than applicable water quality guidelines.

Predicted water quality for the southeast arm is not sensitive to other sensitivity cases specific to surface flows and climatic condition. As a result, no additional elevated results above WQG PAL were identified.

6.8.7 Significance of Residual Effects

6.8.7.1 Change in Surface Water Quantity

The residual effect on surface water quantity in the southeast arm of Springpole Lake is a seasonal decrease (up to a maximum of -10% change) in flows of the southeast arm during active closure (pit-filling), due to planned water takings to expedite open pit basin filling. In all other phases, lake levels and flows in the southeast arm are negligible or not expected to be measurably different than baseline conditions, and thus no residual effects are identified. With the implementation of mitigation measures, the magnitude of the residual effect is low (Level I) as the change is less than 15% of baseline conditions. The duration of the residual effects will occur during pit-filling stage only and of short duration (Level II). The geographic extent of the residual effects will be limited to the LSA (Level I) and reversible (Level I) once the open pit basin is filled. The frequency of the residual effect is moderate (Level II) as it occurs with a certain degree of regularity.

The Springpole Lake, southeast arm system VC is capable of supporting the predicted residual effects, which are localized and minimized with proven mitigation measures, and therefore the ecological and social context is considered low (Level I). As a result, the adverse residual effect on the surface waters of the southeast arm due to a change in surface water quantity is predicted to be not significant.

6.8.7.2 Change in Surface Water Quality

All modelled water quality parameters are predicted to remain below WQG PAL within the southeast arm of Springpole Lake for all phases. With the implementation of mitigation measures, including effluent treatment, the residual effect on surface water quality in the southeast arm is the increase in concentrations above baseline conditions for some parameters and thus is low magnitude (Level I). The geographic extent of the residual effect is low (Level I) and it will be limited to the LSA. The duration of the residual effect predicted to be generally associated with operation and active closure (i.e., when the ETP and STP are discharging), and is thus characterized as moderate (Level II) with a continuous frequency (Level III). The residual effect is reversible, after cessation of site discharges and reclamation of the Project site (Level I).

The Springpole Lake, southeast arm system VC is capable of supporting the predicted residual effects, which are less than WQG PAL, with typical measures, and therefore the ecological and social context is considered low (Level I). As a result, the adverse residual effect on the surface water of the southeast arm due to a change in surface water quality is predicted to be not significant.

6.8.8 Confidence Prediction

There is high confidence in the results of this residual effects assessment for predicted water quality effects for surface waters of the southeast arm. Input data used in modelling studies are of high quality, and the range of existing and projected variability in both the existing regime and the mine-influenced regime are well constrained by model sensitivity cases applied, including water balance modelling (Appendix M-2), surface water quality modelling (Appendix N-2) and hydrogeological numerical modelling (Section 6.5 and Appendix L-2). The predicted effects were determined using well-established models and the conservative approach of the assessment demonstrates that predicted effects on surface water are not underestimated and, with the application of mitigation measures, there will be reliable environmental protection of surface water. Surface water monitoring will be ongoing during construction, operations and closure and will support validation of the surface water predictions.

6.8.9 References

Ministry of the Environment, Conservation and Parks (MECP). 2016. B-1-5 deriving receiving water based point source effluent requirements for Ontario waters. Published June 24, 2016; updated July 12, 2021. https://www.ontario.ca/page/b-1-5-deriving-receiving-water-based-point-source-effluent-requirements-ontario-waters.

Table 6.8-1: Criteria, Indicators and Rationale for Springpole Lake, Southeast Arm

Indicator	Measurable Parameter	Rationale
Change in water quantity	• Lake levels (m amsl) • Catchment area (km^2) • Velocity(m^3/s)	The management of contact water can affect the catchment contributing surface water to local waterbodies. Project activities can result in changes in surface runoff, infiltration and subsequently change the water levels and flows in local waterbodies and watercourses.
Change in water quality	• Concentration of total and dissolved metals (mg/L) • Concentration of nutrients and anions (mg/L) • Concentration of cyanide (mg/L)	Discharge of treated effluent from the effluent treatment plant and seepage from the CDF and ore stockpiles can affect receiving water quality.

Table 6.8-2: Significance Determination Attributes and Rankings for Springpole Lake, Southeast Arm

Attribute	Description	Category
Magnitude	A qualitative or quantitative measure to describe the size or degree of the residual effects relative to baseline conditions	**Level I:** Project-related change of surface water quality in receiving waters is consistent with assessment criteria / water quality guidelines; or Project-related change in surface water quantity less than or equal to 15% of seasonal norms. **Level II:** Project-related change in surface water quality in receiving waters is inconsistent with assessment criteria/water quality guidelines but there is no realistic potential to adversely affect aquatic life beyond any defined mixing zone; Project-related change in surface water quantity is greater than 15% of seasonal norms excluding provisions for offsetting and compensation. **Level III:** Project-related change in surface water quality in receiving waters is inconsistent with assessment criteria / water quality guidelines and is likely to result in an unacceptable adverse effect on aquatic life beyond any defined mixing zones; Project-related change in surface water quantity greater than 15% of seasonal norms is likely to result in an unacceptable adverse effect on aquatic life, excluding provisions for offsetting and compensation.
Geographic Extent	The spatial extent over which the residual effect will take place	**Level I:** Effect is restricted to the LSA. **Level II:** Effect extends beyond the LSA. **Level III:** Effect extends beyond the RSA.
Duration	The time period over which the residual effect will or is expected to occur	**Level I:** Effect occurs over the short term: less than or equal to 3 years. **Level II:** Effect occurs over the medium term: more than 3 years but less than 20 years. **Level III:** Effect occurs over the long term: greater than 20 years.
Frequency	The rate of occurrence of the residual effect	**Level I:** Effect occurs once, infrequently or not at all. **Level II:** Effect occurs intermittently or with a certain degree of regularity. **Level III:** Effect occurs frequently or continuously.
Reversibility	The extent to which the residual effect can be reversed	**Level I:** Effect is fully reversible. **Level II:** Effect is partially reversible or potentially reversible with difficulty. **Level III:** Effect is not reversible.

Table 6.8-3: Annualized Monthly and Annual Flow Statistics for Springpole Lake, Southeast Arm

T	Prorated Monthly Flows (m^3/s) (1,2)													Mean Annual Runoff (mm)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Mean	
Mean	7.0	5.9	5.2	7.5	21.6	22.0	16.3	11.8	11.3	11.6	11.2	8.8	11.7	280.1
1st percentile(3)	3.2	2.7	2.4	3.4	10.0	10.2	7.5	5.4	5.2	5.3	5.2	4.0	5.4	155.0
99th percentile(3)	12.1	10.2	9.0	13.0	37.5	38.3	28.3	20.5	19.6	20.1	19.5	15.2	20.4	457.7

Notes:

(1) Watershed area =1,319 km^2.

(2) Springpole Lake levels and the overall water budget of the north basin are sustained by the larger drainage area entering from Cromarty Lake; these prorated flows consider the total watershed area to Springpole Lake, at its outlet.

(3) The percentile monthly values are annualized monthly values, pro-rated using mean annual flow statistics, not percentile values calculated from individual monthly data.

Table 6.8-4: Springpole Lake Low Flow Indices

Station	Distribution(3)	Springpole Lake (southeast arm)	
		Catchment = 762 km^2	
7-Day Low Flows (1,2)		m^3/s	m^3/day
7Q2	Lognormal	2.8	244,616
7Q5	Lognormal	1.9	166,966
7Q10	Log-Pearson Type III	1.6	136,908
7Q20	Log-Pearson Type III	1.3	109,644

Notes:

(1) Defined as the lowest consecutive 7-day average flow that is expected to occur in a 2-year (7Q2), 5-year (7Q5), 10-year (7Q10), or 20-year (7Q20) return periods.

(2) Springpole Lake levels and the overall water budget of the North Basin are sustained by the larger drainage area entering from Cromarty Lake; these prorated flows consider the total watershed area to Springpole Lake, at its outlet.

(3) Results presented for the most conservative distribution selected from Gumbel, Lognormal, and Log-Pearson Type III.

Table 6.8-5: Springpole Lake (southeast arm) Baseline Surface Water Quality

Parameter	Guideline	Minimum	25th	Average	75th	95th
Hardness (as $CaCO_3$)	-	23.9	26	27.7	28.9	31.6
pH (unitless)	6.5 to 8.5	6.32	7.3	7.35	7.52	7.63
Total suspended solids	-	0.25	1	5.87	1.5	45
Total dissolved solids	-	1.5	38.3	41.8	50	62
Acidity (as $CaCO_3$)	-	1	1	2	2.63	3.17
Alkalinity, total (as $CaCO_3$)	-	10.8	25.6	27.4	29.1	31.6
Ammonia, total (as N)	2.22	0.0025	0.0249	0.4	0.345	2.29
Chloride	128	0.005	0.005	0.005	0.005	0.005
Chloride	128	0.16	0.25	0.402	0.5	0.5
Nitrate-N	3	0.01	0.01	0.0332	0.05	0.076
Nitrite-N	0.06	0.005	0.005	0.00503	0.005	0.005
Nitrate + nitrite	-	0.05	0.05	0.051	0.05	0.05
Phosphorus, total	0.02	0.001	0.0083	0.0108	0.0123	0.0187
Phosphorus-dissolved	-	0.001	0.00515	0.0108	0.015	0.025
Sulphate	-	0.5	1.11	1.3	1.5	1.8
Dissolved inorganic carbon	-	2.2	5.08	7.17	10.1	11.4
Dissolved organic carbon	-	5.6	9.3	10.3	10.9	12.5
Aluminum (Al)	0.8	0.0083	0.016	0.0248	0.0291	0.0424
Antimony (Sb)	0.02	0.00005	0.00005	0.00011	0.00025	0.00025
Arsenic (As)	0.005	0.0005	0.0005	0.000684	0.00079	0.00098
Beryllium (Be)	0.011	0.00001	0.00001	0.0000912	0.00025	0.00025
Cadmium (Cd)	0.0001	0.0000025	0.0000025	0.0000167	0.00005	0.00005
Cobalt (Co)	0.00078	0.00005	0.00005	0.0001	0.00025	0.00025
Copper (Cu)	0.005	0.00025	0.00061	0.000776	0.0008	0.0014
Iron (Fe)	1	0.026	0.05	0.0605	0.062	0.0868
Lead (Pb)	0.009	0.000025	0.000025	0.0000999	0.00025	0.00025
Mercury (Hg)	0.000026	0.0000025	0.0000025	0.00000525	0.0000025	0.0000063
Moly. (Mo)	0.073	0.000025	0.000086	0.000146	0.00025	0.00025
Nickel (Ni)	0.025	0.00025	0.00025	0.000531	0.0005	0.00069
Selenium (Se)	0.002	0.00006	0.000082	0.000349	0.001	0.001
Silver (Ag)	0.0001	0.000005	0.000005	0.0000193	0.00005	0.00005
Thallium (Tl)	0.00025	0.000005	0.000005	0.0000115	0.000025	0.000025
Uranium (U)	0.005	0.000005	0.000017	0.0000273	0.00005	0.00005
Vanadium (V)	0.006	0.00025	0.00025	0.000272	0.00025	0.00025
Zinc (Zn)	0.02	0.0015	0.0015	0.00212	0.0025	0.00365
Zirconium (Zr)	0.004	0.00003	0.0001	0.000219	0.0005	0.0005

Notes:
All units are mg/L (unless indicated otherwise)
All results are reported as total concentrations (e.g., total metals), unless indicated otherwise
Results less than the analytical detection limit (DL) were incorporated into summary statistics as half DL (0.5*DL)
Grey shaded values are greater than identified WQG PAL (none)
$CaCO_3$ = calcium carbonate; - = value is not available.

Table 6.8-6: Potential Interactions of Project Components with Springpole Lake, Southeast Arm

Project Component / Activity	Southeast Arm System
Construction Phase	
Site preparation activities including clearing, grubbing and bulk earthworks	-
Construction of the mine access road and airstrip, including the development and operation of aggregate resource areas	Yes
Development of temporary construction camp and staging areas	Yes
Construction of the fish habitat development area	-
Construction of the transmission line to the Project site	-
Construction of the onsite haul and access roads	-
Construction of dikes in the north basin of Springpole Lake	-
Construction of buildings and onsite infrastructure	-
Construction of the central water storage pond	-
Controlled dewatering of the open pit basin	-
Construction of the starter embankments for the CDF	-
Stripping of lake bed sediment and overburden at the open pit	-
Development of the surficial soil stockpile	-
Initiation of pit development in rock	-
Initiation of stockpiling of ore	-
Establishment and operation of water management and treatment facilities	Yes
Commissioning of the process plant	-
Employment and expenditures	-
Operation Phase	
Operation of the process plant	-
Operation of open pit mine	Yes
Management of overburden, mine rock, tailings and ore in designated facilities	-
Operation of water management and treatment facilities	Yes
Accommodations complex operations	Yes
Operation and maintenance of mine site infrastructure	-
Progressive reclamation activities	-
Employment and expenditures	-
Decommissioning and Closure Phase	
Removal of assets that can be salvaged	-
Demolition and recycling and/or disposal of remaining materials	-
Removal and disposal of demolition-related wastes in approved facilities	-
Reclamation of impacted areas, such as by regrading, placement of cover and revegetation	Yes
Filling the open pit basin with water	Yes
Monitoring and maintenance	-
Employment and expenditures	-

Note:
- = The interaction is not expected, and no further assessment is warranted.

Table 6.8-7: Proposed Mitigation Measures for Potential Springpole Lake, Southeast Arm Effects

Pathways to Potential Effects / Criteria	Phase Con.	Op.	Cl.	Proposed Mitigation Measure
Change in water quantity	•	•	•	Implement mitigation measures for potential effects on surface water (Section 6.6 and 6.7), relevant to the southeast arm including: • A compact mine site will be developed to limit the areal extent of disturbance, and to limit the overall areas of site contact water that requires management. • During controlled dewatering of the open pit basin, clean water will be pumped over the dikes at a rate consistent with the natural variability of Springpole Lake while water not suitable for direct discharge will be pumped to the central water storage pond to manage suspended sediments prior to discharge; • To reduce the overall volume of water required to refill the open pit basin and support fish habitat development area creation, recontouring of a portion of the north end of the open pit basin will be undertaken during operations. • Passive filling with precipitation and groundwater will be supplemented by water transferred from Springpole Lake in a controlled manner to reduce the fill time while maintaining lake water levels in Springpole Lake within the same magnitude and scale as existing conditions natural variation. • During filling of the open pit basin, efforts will also be made to minimize water takings during natural periods of low flow, to maintain lake levels within the same magnitude and scale as existing conditions of Springpole Lake.
	-	•	•	Treated effluent will be discharged at a location where sufficient flow exists to reduce the potential for erosion at the discharge location.
Change in water quality	•	•	•	Implementation of mitigation measures for potential effects on air quality relevant to dust (Section 6.2) including the following: • During construction, operations and active closure, a dust management plan will be implemented to identify potential sources of fugitive dusts, outline mitigation measures that will be employed to control dust generation and detail the inspection and record keeping required to demonstrate that fugitive dusts are being effectively managed. • Dust emissions from roads and mineral stockpiles will be controlled through the application of water spray and supplemented by dust suppressants, if required. • Site roads will be maintained in good condition, with regular inspections and timely maintenance completed to minimize the silt loading on the roads. • Vehicle speeds will be limited.

Table 6.8-7: Proposed Mitigation Measures for Potential Springpole Lake, Southeast Arm Effects

	Phase			
Pathways to Potential Effects / Criteria	**Con.**	**Op.**	**Cl.**	**Proposed Mitigation Measure**
	•	-	-	Implementation of mitigation measures for potential effects on groundwater relevant to surface water (Section 6.5) including: • The CDF will be located on favourable geologic conditions at the Project site to support long-term stability and effective seepage management. • During construction, a geosynthetic clay liner will be installed on the upstream side of the perimeter embankment of the CDF south cell (specifically the south, west, and east sides) to mitigate seepage potential during the operation and closure phases.
	•	•	•	Implement mitigation measures for potential effects on surface water (Section 6.6 and 6.7), relevant to the southeast arm including the following: • A compact mine site will be developed to limit the areal extent of disturbance, and to limit the overall areas of site contact water that requires management. • During construction, operations and active closure, an ESC plan will be implemented to manage runoff water around disturbed areas. The ESC plan will be prepared prior to the construction phase with the purpose of minimizing site erosion and protecting surface water from sedimentation. The ESC plan will provide further details on measures to minimize slope length and grade, ditching and diversion berms, contact water management ponds, use of natural vegetation buffers runoff controls, and working in and around water such as with the installation of the effluent discharge. • During controlled dewatering of the open pit basin, clean water will be pumped over the dikes at a rate consistent with the natural variability of Springpole Lake while water not suitable for direct discharge will be pumped to the central water storage pond to manage suspended sediments prior to discharge.
	-	•	•	Treated effluent will be discharged at a location where sufficient flow exists to reduce the potential for erosion and promote assimilation at the discharge location. A diffuser or other means could be used to encourage greater mixing and attenuation of the effluent plume at the discharge location, if required. Consistent with MECP (2016) Policy B-1-5, the mixing zone size will be minimized to the extent practicable.

Table 6.8-7: Proposed Mitigation Measures for Potential Springpole Lake, Southeast Arm Effects

	Phase			
Pathways to Potential Effects / Criteria	**Con.**	**Op.**	**Cl.**	**Proposed Mitigation Measure**
	-	●	●	The ETP will be designed and operated to produce an effluent quality appropriate for discharge to the environment in accordance with applicable regulatory requirements, including the MDMER. Best available technologies that are economical achievable will be considered for the ETP to meet protection requirements. The ETP will be refined with ongoing Project planning and engineering design, and as discharge criteria are finalized during the approvals process.
	●	●	-	Domestic sewage will be treated to meet regulatory requirements before discharge to the environment. Note that STP discharges will be combined with ETP effluent before discharge to the southeast arm; and excess water in the central water storage pond will be treated at the ETP, before being discharged to the southeast arm to maintain the site water balance.

Note:

Con. = construction; Op. = operations; Cl. = closure; ● = mitigation is applicable; – = mitigation is not applicable.

Table 6.8-8: Discharge from the Mine Site to Springpole Lake Southeast Arm (Node 9)

Month	Construction (m^3/day)			Operations (m^3/day)			Active Closure – Pit Filling (m^3/day)		
	Average	Dry	Wet	Average	Dry	Wet	Average	Dry	Wet
January	232	165	368	86	86	86	365	273	517
February	601	282	882	89	86	89	723	455	996
March	1,496	713	2,337	86	86	86	1,624	857	2,419
April	10,584	6,187	15,248	86	86	86	10,394	6,129	14,916
May	18,352	9,797	27,464	4,617	86	25,594	17,909	9,614	26,742
June	13,859	5,927	22,307	9,598	86	22,330	13,556	5,846	21,725
July	13,738	5,721	22,277	9,411	86	22,267	13,389	5,637	21,687
August	11,702	4,855	18,993	6,677	86	17,837	11,444	4,807	18,513
September	12,007	5,357	19,090	7,162	86	18,038	11,762	5,315	18,628
October	8,444	3,815	13,375	2,370	86	10,319	8,323	3,836	13,103
November	3,822	1,767	6,011	86	86	364	3,859	1,866	5,981
December	891	298	1,527	86	86	86	1,017	442	1,634
Annual average	8,015	3,757	12,551	3,380	86	9,840	7,900	3,772	12,297

Source:
Appendix M-3: Receiving Water Quality Balance Model Report

Table 6.8-9: Summary Assimilation Capacity Assessment Results, Operations Discharge to Springpole Lake, Southeast Arm

Parameter	Influent Quality				Calculated Required Maximum Effluent Quality	
	Base Case		Conservative Case			
	Median	Maximum	Median	Maximum	Case 1: Minimum Monthly Average Receiver Flow (5.2 m^3/s)	Case 2: 7Q20 Low Flow (1.25 m^3/s)
pH	~4	~4	~4	~4	6.5 to 8.5, inclusive at all times	
Sulphate	264	310	327	383	2200	1340
Aluminum (Al)	0.6	0.7	0.7	0.8	12	3.6
Antimony (Sb)	0.02	0.02	0.02	0.02	0.34	0.12
Arsenic (As)	0.01	0.02	0.02	0.02	0.085	0.025
Beryllium (Be)	0.0002	0.0002	0.0002	0.0003	0.187	0.066
Boron (B)	0.03	0.04	0.06	0.06	26	9
Cadmium (Cd)	0.0004	0.0005	0.0005	0.0006	0.01	0.003
Chromium (Cr)	0.001	0.001	0.001	0.002	0.2	0.054
Cobalt (Co)	0.03	0.04	0.04	0.04	0.012	0.0035
Copper (Cu)	0.06	0.07	0.06	0.07	0.09	0.025
Iron (Fe)	5.4	6.8	5.5	6.9	5.4	1.5
Lead (Pb)	0.0007	0.0007	0.0008	0.0009	0.18	0.054
Phosphorus (P)	0.03	0.03	0.07	0.07	0.2	0.06
Molybdenum (Mo)	0.001	0.002	0.003	0.004	1.3	0.438
Nickel (Ni)	0.03	0.03	0.03	0.03	0.45	0.15
Selenium (Se)	0.003	0.003	0.004	0.005	0.03	0.01
Silver (Ag)	0.0003	0.0003	0.0003	0.0003	0.0045	0.001
Thallium (Tl)	0.0002	0.0003	0.0003	0.0004	0.017	0.0048
Uranium (U)	0.007	0.008	0.007	0.009	0.3	0.09
Vanadium (V)	0.004	0.004	0.006	0.006	2.7	0.72
Zinc (Zn)	0.04	0.04	0.08	0.08	0.5	0.14
Mercury (Hg)	0.000005	0.000005	0.000006	0.000006	0.0005	0.00014

Notes:

All units are mg/L (unless indicated otherwise)

Grey highlighted values are greater than calculated effluent criteria

Table 6.8-10: Water Balance Model Results, Springpole Lake, Southeast Arm

Assessment Node	Model Case	Scenario	Estimated Flow (m^3/s)														Change in Flow (%)
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (1) (m^3/s)	
Discharge Node	Base Case (average hydrology)	Baseline	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Construction	7.6	6.4	5.6	8.2	24	24	17	12	11	12	11	8.7	12	0.63	5
		Operations	6.8	5.6	5.0	7.3	21	22	16	12	11	11	11	8.6	12	-0.14	-1
		Active Closure (Pit Filling)	6.2	5.2	4.6	6.8	19	20	15	11	10	10	10	7.8	11	-1.1	-10
		Final Closure	6.9	5.8	5.1	7.5	22	22	16	12	11	12	11	8.7	12	0.0044	0.0
	Extreme dry (1:100-year)	Baseline	3.2	2.7	2.4	3.4	9.9	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	-	
		Construction	3.5	2.9	2.6	3.8	11	11	8.2	6.0	5.7	5.8	5.6	4.4	5.9	0.51	9
		Operations	3.0	2.5	2.2	3.3	9.8	10	7.3	5.3	5.0	5.1	4.9	3.8	5.2	-0.19	-4
		Active Closure (Pit Filling)	2.9	2.4	2.1	3.1	9.0	9.2	6.8	4.9	4.7	4.8	4.6	3.6	4.9	-0.54	-10
		Final Closure	3.2	2.7	2.4	3.5	10	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	-0.0040	-0.1
	Extreme wet (1:100-year)	Baseline	12	10	9.0	13	37	38	28	20	20	20	19	15	20	-	
		Construction	13	11	9.8	14	41	38	28	21	20	20	19	15	21	0.64	3
		Operations	12	10	8.8	13	37	38	28	20	20	20	19	15	20	-0.13	-0.63
		Active Closure (Pit Filling)	11	9.1	8.0	12	34	35	26	19	18	18	18	14	18	-2.0	-10
		Final Closure	12	10	8.9	13	38	38	28	21	20	20	19	15	20	0.0051	0.0
Node 9	Base Case (average hydrology)	Baseline	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Construction	7.6	6.4	5.6	8.2	24	24	17	12	11	12	11	8.7	12	0.63	5
		Operations	6.8	5.6	5.0	7.3	21	22	16	12	11	11	11	8.6	12	-0.14	-1
		Active Closure (Pit Filling)	6.2	5.2	4.6	6.8	19	20	15	11	10	10	10	7.8	11	-1.1	-10
		Final Closure	6.9	5.8	5.1	7.5	22	22	16	12	11	12	11	8.7	12	0.0044	0.0
	Extreme dry (1:100 Year)	Baseline	3.2	2.7	2.4	3.4	9.9	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	-	
		Construction	3.5	2.9	2.6	3.8	11	11	8.2	6.0	5.7	5.8	5.6	4.4	5.9	0.51	9
		Operations	3.0	2.5	2.2	3.3	9.8	10	7.3	5.3	5.0	5.1	4.9	3.8	5.2	-0.19	-4
		Active Closure (Pit Filling)	2.9	2.4	2.1	3.1	9.0	9.2	6.8	4.9	4.7	4.8	4.6	3.6	4.9	-0.54	-10
		Final Closure	3.2	2.7	2.4	3.5	10	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	-0.0040	-0.1
	Extreme wet (1:100-year)	Baseline	12	10	9.0	13	37	38	28	20	20	20	19	15	20	-	
		Construction	13	11	9.8	14	41	38	28	21	20	20	19	15	21	0.64	3
		Operations	12	10	8.8	13	37	38	28	20	20	20	19	15	20	-0.13	-0.6
		Active Closure (Pit Filling)	11	9.1	8.0	12	34	35	26	19	18	18	18	14	18	-2.0	-10
		Final Closure	12	10	8.9	13	38	38	28	21	20	20	19	15	20	0.0051	0.0
Node 10	Base Case (average hydrology)	Baseline	7.3	6.1	5.4	7.8	22	23	17	12	12	12	12	9.1	12	-	
		Construction	7.9	6.6	5.8	8.5	25	25	18	12	12	12	12	9.1	13	0.63	5
		Operations	7.1	5.9	5.2	7.6	22	23	17	12	12	12	11	9.0	12	-0.14	-1
		Pit Filling	6.5	5.5	4.8	7.1	20	21	15	11	11	11	11	8.2	11	-1.1	-9.4
		Final Closure	7.2	6.1	5.3	7.8	22	23	17	12	12	12	12	9.1	12	0.0044	0.037
	Extreme dry (1:100-year)	Baseline	3.3	2.8	2.5	3.6	10	11	7.8	5.7	5.4	5.5	5.4	4.2	5.6	-	
		Construction	3.6	3.0	2.7	3.9	11	12	8.5	6.2	5.9	6.1	5.8	4.6	6.1	0.51	9
		Operations	3.1	2.6	2.2	3.4	10	10	7.6	5.5	5.3	5.4	5.2	4.0	5.4	-0.19	-3

Table 6.8-10: Water Balance Model Results, Springpole Lake, Southeast Arm

Assessment Node	Model Case	Scenario	Estimated Flow (m^3/s)														Change in Flow (%)
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow [1] (m^3/s)	
		Active Closure (Pit Filling)	3.0	2.5	2.2	3.3	9.4	9.6	7.1	5.1	4.9	5.0	4.8	3.8	5.1	-0.54	-10
		Final Closure	3.3	2.8	2.5	3.6	10	11	7.8	5.7	5.4	5.5	5.4	4.2	5.6	-0.0040	-0.1
	Extreme wet (1:100-year)	Baseline	13	11	9.3	14	39	40	29	21	20	21	20	16	21	-	
		Construction	14	12	10.1	15	42	40	30	21	21	21	20	16	22	0.64	3
		Operations	12	10	9.1	13	39	40	29	21	20	21	20	16	21	-0.13	-0.6
		Active Closure (Pit Filling)	11	9.5	8.4	12	35	36	27	19	19	19	18	14	19	-2.0	-9
		Final Closure	13	11	9.3	14	39	40	29	21	21	21	20	16	21	0.0051	0.0

Note:

For each Assessment Node in Springpole Lake Southeast Arm, water balance model results (flows; m^3/s) are compared to flows observed during baseline studies in order to quantify the change in flow by Project phase. Note, there is immaterial local catchment increases between the discharge node and Node 9, so these are equivalent in the water balance model.

Table 6.8-11: Predicted Changes to Springpole Lake Elevation

Watershed ID	Flow Condition	Scenario	Springpole Lake Elevation (m amsl)													
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Elevation (m)
Node 5	Average year	Existing	390.96	390.89	390.86	391.13	391.65	391.71	391.52	391.33	391.27	391.26	391.22	391.11	391.24	-
		Construction	390.98	390.92	390.90	391.20	391.75	391.78	391.55	391.34	391.28	391.27	391.22	391.11	391.27	0.032
		Operations	390.95	390.87	390.84	391.12	391.65	391.71	391.51	391.32	391.27	391.26	391.21	391.09	391.23	-0.0089
		Active closure (pit filling)	390.93	390.84	390.81	391.07	391.57	391.63	391.44	391.26	391.21	391.20	391.15	391.04	391.18	-0.063
		Post-closure	390.96	390.89	390.86	391.13	391.65	391.71	391.52	391.34	391.28	391.27	391.22	391.11	391.24	0.000009
	1:100 dry year	Existing	390.83	390.64	390.56	390.68	391.01	391.11	391.01	390.88	390.83	390.81	390.78	390.71	390.82	-
		Construction	390.83	390.65	390.58	390.72	391.08	391.17	391.06	390.92	390.87	390.85	390.82	390.75	390.86	0.039
		Operations	390.81	390.61	390.53	390.66	391.01	391.10	390.99	390.87	390.81	390.79	390.76	390.69	390.80	-0.018
		Active closure (pit filling)	390.81	390.61	390.53	390.64	390.95	391.05	390.95	390.83	390.78	390.76	390.73	390.66	390.77	-0.046
		Post-closure	390.83	390.64	390.56	390.68	391.01	391.11	391.01	390.88	390.83	390.81	390.78	390.71	390.82	-0.00028
	1:100 wet year	Existing	391.14	391.17	391.18	391.58	392.25	392.26	391.99	391.76	391.70	391.70	391.64	391.48	391.65	-
		Construction	391.17	391.22	391.23	391.68	392.33	392.27	391.98	391.76	391.70	391.70	391.63	391.48	391.68	0.028
		Operations	391.13	391.16	391.16	391.59	392.25	392.26	391.98	391.75	391.70	391.69	391.63	391.46	391.65	-0.0053
		Active closure (pit filling)	391.10	391.11	391.11	391.51	392.14	392.15	391.89	391.67	391.62	391.61	391.55	391.40	391.57	-0.081
		Post-closure	391.13	391.17	391.17	391.58	392.25	392.26	391.99	391.76	391.70	391.70	391.63	391.47	391.65	-0.000025

Table 6.8-12: Base Case Water Quality Model Results, Node 12 (discharge location)

Project Phase	Month	Parameter	Ammonia-N	Nitrate-N	Nitrite-N	Phosphorus	Total Cyanide	Aluminum	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Tungsten	Uranium	Vanadium	Zinc
		WQG PAL	1.8	3	0.06	0.02	0.005	0.83	0.020	0.005	0.01100	1.50	0.0001	0.0089	0.00078	0.005	0.3	0.00906	0.0000260	0.073	0.025	0.1	0.00025	0.0008	0.03000	0.005	0.12	0.011
Existing condition	January		0.008	0.067	0.005	0.012	0.001	0.016	0.00005	0.0006	0.00005	0.0050	0.000008	0.00025	0.00005	0.00076	0.050	0.00003	0.0000025	0.00025	0.00025	0.00100	0.000050	0.000025	0.00005	0.00005	0.00025	0.0015
	February		0.008	0.067	0.005	0.012	0.001	0.016	0.00005	0.0006	0.00005	0.0050	0.000008	0.00025	0.00005	0.00076	0.050	0.00003	0.0000025	0.00025	0.00025	0.00100	0.000050	0.000025	0.00005	0.00005	0.00025	0.0015
	March		0.008	0.067	0.005	0.012	0.001	0.016	0.00005	0.0006	0.00005	0.0050	0.000008	0.00025	0.00005	0.00076	0.050	0.00003	0.0000025	0.00025	0.00025	0.00100	0.000050	0.000025	0.00005	0.00005	0.00025	0.0015
	April		0.056	0.017	0.005	0.009	0.001	0.021	0.00005	0.0006	0.00001	0.0050	0.000002	0.00021	0.00005	0.00085	0.050	0.00003	0.0000025	0.00009	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	May		0.056	0.017	0.005	0.009	0.001	0.021	0.00005	0.0006	0.00001	0.0050	0.000002	0.00021	0.00005	0.00085	0.050	0.00003	0.0000025	0.00009	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	June		0.056	0.017	0.005	0.009	0.001	0.021	0.00005	0.0006	0.00001	0.0050	0.000002	0.00021	0.00005	0.00085	0.050	0.00003	0.0000025	0.00009	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	July		0.025	0.037	0.005	0.011	0.001	0.023	0.00005	0.0007	0.00001	0.0050	0.000002	0.00023	0.00005	0.00064	0.050	0.00003	0.0000025	0.00010	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	August		0.025	0.037	0.005	0.011	0.001	0.023	0.00005	0.0007	0.00001	0.0050	0.000002	0.00023	0.00005	0.00064	0.050	0.00003	0.0000025	0.00010	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	September		0.025	0.037	0.005	0.011	0.001	0.023	0.00005	0.0007	0.00001	0.0050	0.000002	0.00023	0.00005	0.00064	0.050	0.00003	0.0000025	0.00010	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	October		0.488	0.030	0.005	0.011	0.001	0.016	0.00015	0.0006	0.00013	0.0050	0.000026	0.00025	0.00005	0.00061	0.054	0.00003	0.0000025	0.00017	0.00025	0.00054	0.000028	0.000015	0.00027	0.00003	0.00025	0.0020
	November		0.488	0.030	0.005	0.011	0.001	0.016	0.00015	0.0006	0.00013	0.0050	0.000026	0.00025	0.00005	0.00061	0.054	0.00003	0.0000025	0.00017	0.00025	0.00054	0.000028	0.000015	0.00027	0.00003	0.00025	0.0020
	December		0.488	0.030	0.005	0.011	0.001	0.016	0.00015	0.0006	0.00013	0.0050	0.000026	0.00025	0.00005	0.00061	0.054	0.00003	0.0000025	0.00017	0.00025	0.00054	0.000028	0.000015	0.00027	0.00003	0.00025	0.0020
Construction	January		0.018	0.056	0.005	0.011	0.001	0.012	0.00005	0.0007	0.00005	0.0050	0.000006	0.00024	0.00005	0.00076	0.040	0.00003	0.0000025	0.00021	0.00033	0.00071	0.000042	0.000019	0.00005	0.00005	0.00025	0.0015
	February		0.039	0.051	0.005	0.011	0.001	0.012	0.00005	0.0007	0.00005	0.0050	0.000005	0.00024	0.00005	0.00076	0.039	0.00003	0.0000025	0.00019	0.00031	0.00061	0.000037	0.000016	0.00005	0.00004	0.00025	0.0015
	March		0.039	0.051	0.005	0.011	0.001	0.012	0.00005	0.0007	0.00005	0.0050	0.000005	0.00024	0.00005	0.00076	0.039	0.00003	0.0000025	0.00019	0.00031	0.00061	0.000037	0.000016	0.00005	0.00004	0.00025	0.0015
	April		0.098	0.015	0.005	0.009	0.001	0.017	0.00005	0.0007	0.00004	0.0050	0.000006	0.00021	0.00005	0.00091	0.047	0.00003	0.0000025	0.00010	0.00037	0.00010	0.000006	0.000015	0.00005	0.00002	0.00025	0.0015
	May		0.099	0.015	0.005	0.009	0.001	0.017	0.00005	0.0007	0.00004	0.0050	0.000006	0.00021	0.00005	0.00091	0.047	0.00003	0.0000025	0.00010	0.00037	0.00010	0.000006	0.000015	0.00005	0.00002	0.00025	0.0015
	June		0.098	0.015	0.005	0.009	0.001	0.017	0.00005	0.0007	0.00004	0.0050	0.000006	0.00021	0.00005	0.00091	0.047	0.00003	0.0000025	0.00010	0.00037	0.00010	0.000006	0.000015	0.00005	0.00002	0.00025	0.0015
	July		0.046	0.022	0.005	0.011	0.001	0.016	0.00005	0.0008	0.00004	0.0050	0.000002	0.00024	0.00005	0.00067	0.041	0.00003	0.0000025	0.00011	0.00025	0.00010	0.000006	0.000005	0.00005	0.00002	0.00025	0.0015
	August		0.036	0.021	0.005	0.010	0.001	0.016	0.00005	0.0008	0.00004	0.0050	0.000002	0.00024	0.00005	0.00066	0.041	0.00003	0.0000025	0.00011	0.00025	0.00010	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	September		0.027	0.021	0.005	0.010	0.001	0.016	0.00005	0.0009	0.00003	0.0050	0.000002	0.00024	0.00005	0.00065	0.042	0.00003	0.0000025	0.00011	0.00025	0.00010	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	October		0.248	0.018	0.005	0.010	0.001	0.013	0.00009	0.0010	0.00005	0.0050	0.000011	0.00022	0.00005	0.00063	0.044	0.00003	0.0000025	0.00012	0.00025	0.00026	0.000013	0.000009	0.00013	0.00002	0.00025	0.0017
	November		0.248	0.018	0.005	0.010	0.001	0.013	0.00009	0.0010	0.00005	0.0050	0.000011	0.00022	0.00005	0.00063	0.044	0.00003	0.0000025	0.00012	0.00025	0.00026	0.000013	0.000009	0.00013	0.00002	0.00025	0.0017
	December		0.249	0.018	0.005	0.010	0.001	0.013	0.00009	0.0010	0.00005	0.0050	0.000011	0.00022	0.00005	0.00062	0.044	0.00003	0.0000025	0.00012	0.00025	0.00026	0.000013	0.000009	0.00013	0.00002	0.00025	0.0017
Operations	January		0.017	0.058	0.005	0.011	0.001	0.012	0.00012	0.0007	0.00007	0.0054	0.000006	0.00026	0.00006	0.00076	0.042	0.00003	0.0000025	0.00034	0.00037	0.00072	0.000044	0.000019	0.00005	0.00006	0.00045	0.0015
	February		0.017	0.059	0.005	0.011	0.001	0.012	0.00014	0.0007	0.00007	0.0054	0.000006	0.00026	0.00006	0.00077	0.043	0.00003	0.0000025	0.00037	0.00038	0.00072	0.000044	0.000019	0.00005	0.00007	0.00051	0.0015
	March		0.017	0.059	0.005	0.011	0.001	0.013	0.00016	0.0007	0.00008	0.0055	0.000006	0.00026	0.00006	0.00077	0.043	0.00003	0.0000025	0.00040	0.00039	0.00072	0.000045	0.000019	0.00005	0.00007	0.00057	0.0015
	April		0.088	0.016	0.005	0.008	0.001	0.018	0.00017	0.0007	0.00007	0.0056	0.000007	0.00023	0.00006	0.00095	0.053	0.00004	0.0000025	0.00031	0.00047	0.00011	0.000008	0.000018	0.00005	0.00004	0.00060	0.0016
	May		0.088	0.015	0.005	0.008	0.001	0.018	0.00014	0.0007	0.00006	0.0054	0.000007	0.00022	0.00006	0.00095	0.052	0.00003	0.0000025	0.00025	0.00045	0.00011	0.000007	0.000017	0.00005	0.00004	0.00049	0.0015
	June		0.089	0.015	0.005	0.008	0.001	0.026	0.00083	0.0009	0.00043	0.0122	0.000009	0.00049	0.00008	0.00108	0.085	0.00016	0.0000028	0.00280	0.00131	0.00018	0.000040	0.000017	0.00005	0.00021	0.00468	0.0022
	July		0.025	0.023	0.005	0.011	0.001	0.033	0.00158	0.0012	0.00084	0.0196	0.000007	0.00081	0.00010	0.00094	0.114	0.00030	0.0000032	0.00557	0.00209	0.00026	0.000077	0.000005	0.00005	0.00040	0.00924	0.0028
	August		0.026	0.024	0.005	0.011	0.001	0.038	0.00208	0.0013	0.00111	0.0244	0.000008	0.00100	0.00011	0.00104	0.137	0.00039	0.0000034	0.00736	0.00270	0.00031	0.000100	0.000005	0.00005	0.00052	0.01218	0.0033
	September		0.026	0.024	0.005	0.011	0.001	0.038	0.00203	0.0013	0.00109	0.0240	0.000008	0.00099	0.00011	0.00103	0.135	0.00038	0.0000034	0.00721	0.00264	0.00030	0.000098	0.000005	0.00005	0.00051	0.01193	0.0032
	October		0.249	0.021	0.005	0.011	0.001	0.037	0.00230	0.0014	0.00123	0.0262	0.000017	0.00100	0.00012	0.00105	0.148	0.00042	0.0000035	0.00806	0.00293	0.00049	0.000117	0.000009	0.00014	0.00057	0.01330	0.0036
	November		0.250	0.021	0.005	0.010	0.001	0.021	0.00085	0.0011	0.00044	0.0119	0.000013	0.00049	0.00008	0.00076	0.078	0.00015	0.0000028	0.00271	0.00112	0.00034	0.000047	0.000009	0.00014	0.00021	0.00450	0.0023
	December		0.250	0.019	0.005	0.010	0.001	0.013	0.00014	0.0010	0.00007	0.0053	0.000011	0.00023	0.00005	0.00063	0.046	0.00003	0.0000025	0.00022	0.00028	0.00027	0.000015	0.000009	0.00014	0.00004	0.00041	0.0017
Active closure	January		0.129	0.115	0.006	0.011	0.001	0.025	0.00048	0.0008	0.00026	0.0344	0.000007	0.00041	0.00007	0.00083	0.045	0.00019	0.0000030	0.00166	0.00082	0.00267	0.000060	0.000033	0.00061	0.00033	0.00263	0.0019
	February		0.068	0.083	0.006	0.011	0.001	0.018	0.00027	0.0007	0.00014	0.0183	0.000006	0.00032	0.00006	0.00079	0.042	0.00010	0.0000027	0.00087	0.00055	0.00159	0.000050	0.000025	0.00030	0.00018	0.00132	0.0017
	March		0.136	0.119	0.006	0.011	0.001	0.026	0.00052	0.0008	0.00027	0.0362	0.000007	0.00042	0.00007	0.00084	0.045	0.00020	0.0000030	0.00175	0.00085	0.00279	0.000061	0.000034	0.00065	0.00035	0.00277	0.0019
	April		0.391	0.172	0.008	0.008	0.001	0.053	0.00117	0.0010	0.00060	0.0845	0.000011	0.00066	0.00009	0.00115	0.063	0.00048	0.0000038	0.00404	0.00172	0.00540	0.000054	0.000055	0.00157	0.00079	0.00668	0.0026
	May		1.408	0.706	0.018	0.010	0.003	0.171	0.00471	0.0017	0.00251	0.3516	0.000025	0.00218	0.00020	0.00185	0.107	0.00201	0.0000079	0.01727	0.00617	0.02321	0.000220	0.000182	0.00665	0.00333	0.02831	0.0064
	June		0.881	0.429	0.013	0.009	0.002	0.110	0.00287	0.0013	0.00152	0.2132	0.000018	0.00139	0.00014	0.00148	0.084	0.00121	0.0000058	0.01041	0.00387	0.01399	0.000134	0.000116	0.00402	0.00201	0.01710	0.0045
	July		0.613	0.330	0.011	0.011	0.002	0.084	0.00215	0.0013	0.00114	0.1595	0.000011	0.00112	0.00012	0.00106	0.067	0.00091	0.0000049	0.00776	0.00282	0.01040	0.000101	0.000079	0.00300	0.00150	0.01276	0.0037
	August		0.811	0.434	0.013	0.011	0.002	0.107	0.00286	0.0015	0.00151	0.2115	0.000013	0.00142	0.00014	0.00119	0.076	0.00120	0.0000057	0.01033	0.00369	0.01387	0.000133	0.000104	0.00399	0.00199	0.01696	0.0044
	September		0.950	0.507	0.014	0.012	0.002	0.123	0.00334	0.0016	0.00177	0.2480	0.000015	0.00163	0.00016	0.00129	0.082	0.00141	0.0000063	0.01214	0.00430	0.01630	0.000155	0.000121	0.00468	0.00234	0.01992	0.0050
	October		1.238	0.538	0.015	0.011	0.002	0.128	0.00361	0.0017	0.00191	0.2653	0.000025	0.00170	0.00017	0.00131	0.087	0.00151	0.0000066	0.01302	0.00459	0.01761	0.000174	0.000133	0.00509	0.00251	0.02132	0.0054
	November		0.936	0.379	0.012	0.011	0.002	0.093	0.00255	0.0015	0.00135	0.1858	0.000021	0.00125	0.00013	0.00110	0.074	0.00106	0.0000053	0.00908	0.00326	0.01232	0.000125	0.000095	0.00358	0.00175	0.01488	0.0043
	December		0.580	0.191	0.008	0.010	0.001	0.051	0.00127	0.0012	0.00067	0.0918	0.000016	0.00071	0.00009	0.00085	0.058	0.00052	0.0000039	0.00442	0.00170	0.00605	0.000067	0.000050	0.00179	0.00086	0.00728	0.0029
Post-closure	January		0.021	0.065	0.005	0.011	0.001	0.013	0.00007	0.0007	0.00005	0.0050	0.000006	0.00025	0.00005	0.00076	0.040	0.00003	0.0000026	0.00022	0.00035	0.00072	0.000042	0.000019	0.00005	0.00006	0.00026	0.0015
	February		0.021	0.064	0.005	0.011	0.001	0.013	0.00007	0.0007	0.00005	0.0050	0.000006	0.00025	0.00005	0.00076	0.040	0.00003	0.0000026	0.00022	0.00035	0.00072	0.000042	0.000019	0.00005	0.00006	0.00026	0.0015
	March		0.023	0.066	0.005	0.011	0.001	0.013	0.00008	0.0007	0.00005	0.0051	0.000006	0.00025	0.00005	0.00076	0.040	0.00003	0.0000026	0.00022	0.00036	0.00072	0.000042	0.000019	0.00005	0.00006	0.00027	0.0015
	April		0.095	0.030	0.005	0.008	0.001	0.019	0.00008	0.0007	0.00004	0.0051	0.000007	0.00022	0.00005	0.00094	0.049	0.00003	0.0000026	0.00011	0.00044	0.00013	0.000005	0.000017	0.00006	0.00004	0.00027	0.0015
	May		0.101	0.050	0.006	0.008	0.001	0.018	0.00008	0.0007	0.00004	0.0051	0.000008	0.00022	0.00006	0.00094	0.049	0.00003	0.0000026	0.00012	0.00049	0.00015	0.000005	0.000017	0.00006	0.00005	0.00026	0.0015
	June		0.098	0.040	0.005	0.008	0.001	0.018	0.00008	0.0007	0.00004	0.0051	0.000007	0.00021	0.00006	0.00094	0.049	0.00003	0.0000026	0.00012	0.00047	0.00014	0.000005	0.000017	0.00006	0.00005	0.00026	0.0015
	July		0.031	0.037	0.005	0.011	0.001	0.017	0.00007	0.0009	0.00004	0.0051	0.000003	0.00025	0.00005	0.00065	0.042	0.00003	0.0000026	0.00012	0.00029	0.00012	0.000005	0.000005	0.00005	0.00004	0.00026	0.0015
	August		0.033	0.040	0.005	0.011	0.001	0.017	0.00008	0.0009	0.00004	0.0051	0.000003	0.00025	0.00005	0.00065	0.042	0.00003	0.0000026	0.00012	0.00030	0.00012	0.000005	0.000005	0.00006	0.00004	0.00027	0.0015

Table 6.8-12: Base Case Water Quality Model Results, Node 12 (discharge location)

Project Phase	Month	Parameter	Ammonia-N	Nitrate-N	Nitrite-N	Phosphorus	Total Cyanide	Aluminum	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Tungsten	Uranium	Vanadium	Zinc
		WQG PAL	**1.8**	**3**	**0.06**	**0.02**	**0.005**	**0.83**	**0.020**	**0.005**	**0.01100**	**1.50**	**0.0001**	**0.0089**	**0.00078**	**0.005**	**0.3**	**0.00906**	**0.0000260**	**0.073**	**0.025**	**0.1**	**0.00025**	**0.0008**	**0.03000**	**0.005**	**0.12**	**0.011**
	September		0.034	0.043	0.005	0.011	0.001	0.017	**0.00008**	0.0009	**0.00004**	0.0051	0.000003	0.00025	0.00005	0.00065	0.042	0.00003	**0.0000026**	0.00012	0.00031	0.00013	0.000005	0.000005	0.00006	**0.00004**	0.00027	0.0015
	October		0.258	**0.048**	0.006	0.010	0.001	0.014	0.00012	**0.0010**	0.00006	0.0051	0.000012	0.00023	0.00006	0.00063	0.044	0.00003	**0.0000026**	0.00014	0.00033	0.00030	0.000014	0.000009	0.00014	**0.00005**	0.00027	0.0017
	November		0.257	0.041	0.005	0.010	0.001	0.014	0.00012	**0.0010**	0.00006	0.0051	0.000012	0.00023	0.00005	0.00063	0.044	0.00003	**0.0000026**	0.00014	0.00031	0.00029	0.000014	0.000009	0.00014	0.00005	0.00027	0.0017
	December		0.254	0.031	0.005	0.010	0.001	0.013	0.00010	**0.0010**	0.00006	0.0050	0.000012	0.00022	0.00005	0.00063	0.044	0.00003	**0.0000026**	0.00013	0.00029	0.00028	0.000014	0.000009	0.00014	0.00004	0.00026	0.0017

Notes:

All units are mg/L.

Water quality model results summarized in this table are Base Case (Expected Case); results of model sensitivity cases are presented in Appendix N-2

WQG PAL (long-term exposure) are identified in Table 6.6-3.

As applicable, numerical guideline values were calculated using the most conservative approach (i.e., 25th percentile baseline values for ameliorating factors, save for zinc, which uses 75th percentile pH for the FEQG calculation). For Birch Lake these data were as follows:

	25th	75th
pH	7.4	7.6
Hardness (mg/L)	28	
Dissolved organic carbon (DOC) (mg/L)	8.1	
Chloride (mg/L)	0.25	
Alkalinity (mg/L)	28	

Only model results for parameters with WQG PAL are summarized here; results for all modelled parameters are presented in Appendix N-2

Grey shaded values are greater than water quality guidelines (none).

Bolded purple values were determined to be measurably different than existing conditions (15% or greater change relative to baseline conditions).

Table 6.8-13: Base Case Water Quality Model Results, Node 9

Project Phase	Month (Parameter)	Ammonia-N	Nitrate-N	Nitrite-N	Phosphorus	Total Cyanide	Aluminum	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Tungsten	Uranium	Vanadium	Zinc
	WQG PAL	1.8	3	0.06	0.02	0.005	0.83	0.020	0.005	0.01100	1.50	0.0001	0.0089	0.00078	0.005	0.3	0.00906	0.0000260	0.073	0.025	0.1	0.00025	0.0008	0.03000	0.005	0.12	0.011
Existing condition	January	0.008	0.067	0.005	0.012	0.001	0.016	0.00010	0.0006	0.00006	0.0050	0.000008	0.00025	0.00005	0.00076	0.050	0.00003	0.0000050	0.00025	0.00025	0.00100	0.000050	0.000025	0.00005	0.00005	0.00025	0.0015
	February	0.008	0.067	0.005	0.012	0.001	0.016	0.00010	0.0006	0.00006	0.0050	0.000008	0.00025	0.00005	0.00076	0.050	0.00003	0.0000050	0.00025	0.00025	0.00100	0.000050	0.000025	0.00005	0.00005	0.00025	0.0015
	March	0.008	0.067	0.005	0.012	0.001	0.016	0.00010	0.0006	0.00006	0.0050	0.000008	0.00025	0.00005	0.00076	0.050	0.00003	0.0000050	0.00025	0.00025	0.00100	0.000050	0.000025	0.00005	0.00005	0.00025	0.0015
	April	0.056	0.017	0.005	0.009	0.001	0.021	0.00010	0.0006	0.00006	0.0050	0.000002	0.00025	0.00005	0.00085	0.050	0.00003	0.0000050	0.00009	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	May	0.056	0.017	0.005	0.009	0.001	0.021	0.00010	0.0006	0.00006	0.0050	0.000002	0.00025	0.00005	0.00085	0.050	0.00003	0.0000050	0.00009	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	June	0.056	0.017	0.005	0.009	0.001	0.021	0.00010	0.0006	0.00006	0.0050	0.000002	0.00025	0.00005	0.00085	0.050	0.00003	0.0000050	0.00009	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	July	0.025	0.037	0.005	0.011	0.001	0.023	0.00010	0.0007	0.00006	0.0050	0.000002	0.00025	0.00005	0.00064	0.050	0.00003	0.0000050	0.00010	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	August	0.025	0.037	0.005	0.011	0.001	0.023	0.00010	0.0007	0.00006	0.0050	0.000002	0.00025	0.00005	0.00064	0.050	0.00003	0.0000050	0.00010	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	September	0.025	0.037	0.005	0.011	0.001	0.023	0.00010	0.0007	0.00006	0.0050	0.000002	0.00025	0.00005	0.00064	0.050	0.00003	0.0000050	0.00010	0.00025	0.00009	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	October	0.488	0.030	0.005	0.011	0.001	0.016	0.00010	0.0006	0.00006	0.0050	0.000026	0.00025	0.00005	0.00061	0.054	0.00003	0.0000050	0.00017	0.00025	0.00054	0.000028	0.000015	0.00005	0.00003	0.00025	0.0020
	November	0.488	0.030	0.005	0.011	0.001	0.016	0.00010	0.0006	0.00006	0.0050	0.000026	0.00025	0.00005	0.00061	0.054	0.00003	0.0000050	0.00017	0.00025	0.00054	0.000028	0.000015	0.00005	0.00003	0.00025	0.0020
	December	0.488	0.030	0.005	0.011	0.001	0.016	0.00010	0.0006	0.00006	0.0050	0.000026	0.00025	0.00005	0.00061	0.054	0.00003	0.0000050	0.00017	0.00025	0.00054	0.000028	0.000015	0.00005	0.00003	0.00025	0.0020
Construction	January	0.018	0.057	0.005	0.011	0.001	0.012	0.00010	0.0007	0.00006	0.0050	0.000006	0.00025	0.00005	0.00076	0.040	0.00003	0.0000050	0.00021	0.00032	0.00072	0.000042	0.000019	0.00005	0.00005	0.00025	0.0015
	February	0.038	0.052	0.005	0.011	0.001	0.012	0.00010	0.0007	0.00006	0.0050	0.000005	0.00025	0.00005	0.00076	0.040	0.00003	0.0000050	0.00020	0.00031	0.00062	0.000037	0.000017	0.00005	0.00004	0.00025	0.0015
	March	0.038	0.052	0.005	0.011	0.001	0.012	0.00010	0.0007	0.00006	0.0050	0.000005	0.00025	0.00005	0.00076	0.040	0.00003	0.0000050	0.00020	0.00031	0.00062	0.000037	0.000017	0.00005	0.00004	0.00025	0.0015
	April	0.097	0.015	0.005	0.009	0.001	0.017	0.00010	0.0007	0.00006	0.0050	0.000006	0.00025	0.00005	0.00091	0.047	0.00003	0.0000050	0.00010	0.00037	0.00010	0.000006	0.000015	0.00005	0.00002	0.00025	0.0015
	May	0.097	0.015	0.005	0.009	0.001	0.017	0.00010	0.0007	0.00006	0.0050	0.000006	0.00025	0.00005	0.00091	0.047	0.00003	0.0000050	0.00010	0.00037	0.00010	0.000006	0.000015	0.00005	0.00002	0.00025	0.0015
	June	0.097	0.015	0.005	0.009	0.001	0.017	0.00010	0.0007	0.00006	0.0050	0.000006	0.00025	0.00005	0.00091	0.047	0.00003	0.0000050	0.00010	0.00037	0.00010	0.000006	0.000015	0.00005	0.00002	0.00025	0.0015
	July	0.045	0.022	0.005	0.011	0.001	0.016	0.00010	0.0008	0.00006	0.0050	0.000002	0.00025	0.00005	0.00067	0.041	0.00003	0.0000050	0.00011	0.00025	0.00010	0.000006	0.000005	0.00005	0.00002	0.00025	0.0015
	August	0.036	0.022	0.005	0.011	0.001	0.016	0.00010	0.0008	0.00006	0.0050	0.000002	0.00025	0.00005	0.00066	0.042	0.00003	0.0000050	0.00011	0.00025	0.00010	0.000006	0.000005	0.00005	0.00002	0.00025	0.0015
	September	0.027	0.022	0.005	0.010	0.001	0.016	0.00010	0.0008	0.00006	0.0050	0.000002	0.00025	0.00005	0.00065	0.042	0.00003	0.0000050	0.00011	0.00025	0.00010	0.000005	0.000005	0.00005	0.00002	0.00025	0.0015
	October	0.257	0.018	0.005	0.010	0.001	0.013	0.00010	0.0010	0.00006	0.0050	0.000012	0.00025	0.00005	0.00063	0.044	0.00003	0.0000050	0.00012	0.00025	0.00027	0.000014	0.000009	0.00005	0.00002	0.00025	0.0017
	November	0.258	0.018	0.005	0.010	0.001	0.013	0.00010	0.0010	0.00006	0.0050	0.000012	0.00025	0.00005	0.00063	0.044	0.00003	0.0000050	0.00012	0.00025	0.00027	0.000014	0.000009	0.00005	0.00002	0.00025	0.0017
	December	0.258	0.018	0.005	0.010	0.001	0.013	0.00010	0.0010	0.00006	0.0050	0.000012	0.00025	0.00005	0.00062	0.044	0.00003	0.0000050	0.00012	0.00025	0.00027	0.000014	0.000009	0.00005	0.00002	0.00025	0.0017
Operations	January	0.017	0.059	0.005	0.011	0.001	0.012	0.00012	0.0007	0.00007	0.0053	0.000006	0.00026	0.00006	0.00076	0.042	0.00003	0.0000050	0.00033	0.00037	0.00073	0.000044	0.000019	0.00005	0.00006	0.00045	0.0015
	February	0.017	0.059	0.005	0.011	0.001	0.013	0.00014	0.0007	0.00007	0.0054	0.000006	0.00026	0.00006	0.00077	0.043	0.00003	0.0000050	0.00036	0.00038	0.00073	0.000044	0.000019	0.00005	0.00007	0.00050	0.0015
	March	0.017	0.060	0.005	0.011	0.001	0.013	0.00016	0.0007	0.00008	0.0055	0.000006	0.00026	0.00006	0.00077	0.043	0.00003	0.0000050	0.00040	0.00039	0.00073	0.000045	0.000019	0.00005	0.00007	0.00055	0.0015
	April	0.087	0.016	0.005	0.008	0.001	0.018	0.00017	0.0007	0.00006	0.0056	0.000007	0.00023	0.00006	0.00095	0.053	0.00004	0.0000050	0.00031	0.00046	0.00011	0.000008	0.000017	0.00005	0.00004	0.00058	0.0016
	May	0.087	0.015	0.005	0.008	0.001	0.018	0.00013	0.0007	0.00005	0.0054	0.000007	0.00022	0.00006	0.00094	0.052	0.00003	0.0000050	0.00024	0.00044	0.00011	0.000007	0.000017	0.00005	0.00004	0.00048	0.0015
	June	0.087	0.015	0.005	0.008	0.001	0.026	0.00080	0.0009	0.00042	0.0119	0.000009	0.00048	0.00008	0.00107	0.084	0.00015	0.0000028	0.00269	0.00127	0.00018	0.000039	0.000017	0.00005	0.00020	0.00451	0.0021
	July	0.025	0.024	0.005	0.011	0.001	0.032	0.00152	0.0012	0.00081	0.0190	0.000006	0.00079	0.00009	0.00093	0.111	0.00029	0.0000032	0.00535	0.00202	0.00025	0.000074	0.000005	0.00005	0.00038	0.00888	0.0028
	August	0.026	0.025	0.005	0.011	0.001	0.038	0.00200	0.0013	0.00107	0.0236	0.000008	0.00097	0.00011	0.00103	0.134	0.00037	0.0000034	0.00707	0.00260	0.00030	0.000096	0.000005	0.00005	0.00050	0.01171	0.0032
	September	0.026	0.024	0.005	0.011	0.001	0.037	0.00196	0.0013	0.00104	0.0232	0.000008	0.00096	0.00011	0.00102	0.132	0.00037	0.0000034	0.00692	0.00255	0.00030	0.000094	0.000005	0.00005	0.00049	0.01146	0.0031
	October	0.259	0.021	0.005	0.011	0.001	0.036	0.00222	0.0014	0.00119	0.0254	0.000018	0.00102	0.00011	0.00104	0.145	0.00041	0.0000035	0.00775	0.00282	0.00049	0.000114	0.000009	0.00014	0.00055	0.01279	0.0035
	November	0.259	0.021	0.005	0.010	0.001	0.021	0.00082	0.0011	0.00042	0.0117	0.000014	0.00048	0.00008	0.00076	0.077	0.00015	0.0000028	0.00261	0.00109	0.00035	0.000046	0.000009	0.00014	0.00020	0.00433	0.0023
	December	0.259	0.019	0.005	0.010	0.001	0.013	0.00014	0.0010	0.00007	0.0053	0.000012	0.00023	0.00005	0.00063	0.046	0.00003	0.0000050	0.00022	0.00028	0.00028	0.000015	0.000009	0.00014	0.00004	0.00040	0.0017
Active closure	January	0.124	0.113	0.006	0.011	0.001	0.025	0.00046	0.0008	0.00025	0.0332	0.000007	0.00040	0.00007	0.00083	0.045	0.00019	0.0000029	0.00161	0.00079	0.00079	0.000060	0.000033	0.00059	0.00032	0.00253	0.0019
	February	0.065	0.082	0.005	0.011	0.001	0.018	0.00026	0.0007	0.00014	0.0177	0.000006	0.00032	0.00006	0.00079	0.043	0.00010	0.0000027	0.00084	0.00054	0.00077	0.000050	0.000025	0.00029	0.00018	0.00128	0.0017
	March	0.131	0.117	0.006	0.011	0.001	0.025	0.00050	0.0008	0.00026	0.0349	0.000007	0.00041	0.00007	0.00084	0.045	0.00020	0.0000030	0.00169	0.00082	0.00080	0.000061	0.000034	0.00062	0.00034	0.00267	0.0019
	April	0.377	0.166	0.008	0.008	0.001	0.052	0.00113	0.0009	0.00058	0.0813	0.000011	0.00064	0.00009	0.00113	0.062	0.00046	0.0000037	0.00388	0.00166	0.00027	0.000052	0.000053	0.00151	0.00076	0.00643	0.0026
	May	1.355	0.679	0.018	0.010	0.003	0.165	0.00453	0.0017	0.00241	0.3380	0.000024	0.00210	0.00020	0.00181	0.104	0.00193	0.0000077	0.01660	0.00594	0.00065	0.000211	0.000175	0.00640	0.00320	0.02721	0.0062
	June	0.848	0.413	0.013	0.009	0.002	0.106	0.00276	0.0013	0.00146	0.2050	0.000017	0.00134	0.00014	0.00146	0.082	0.00117	0.0000056	0.01001	0.00372	0.00042	0.000129	0.000112	0.00386	0.00193	0.01644	0.0043
	July	0.590	0.318	0.011	0.011	0.002	0.082	0.00207	0.0013	0.00109	0.1534	0.000010	0.00109	0.00012	0.00104	0.067	0.00087	0.0000048	0.00746	0.00272	0.00030	0.000097	0.000076	0.00288	0.00144	0.01227	0.0036
	August	0.780	0.418	0.013	0.011	0.002	0.104	0.00275	0.0014	0.00145	0.2033	0.000013	0.00137	0.00014	0.00117	0.075	0.00116	0.0000056	0.00993	0.00355	0.00035	0.000128	0.000100	0.00383	0.00192	0.01630	0.0043
	September	0.914	0.488	0.014	0.012	0.002	0.120	0.00321	0.0015	0.00170	0.2384	0.000015	0.00157	0.00015	0.00126	0.081	0.00136	0.0000062	0.01167	0.00414	0.00040	0.000149	0.000117	0.00450	0.00225	0.01914	0.0048
	October	1.209	0.518	0.014	0.011	0.002	0.124	0.00348	0.0017	0.00184	0.2550	0.000025	0.00165	0.00016	0.00128	0.086	0.00145	0.0000064	0.01251	0.00441	0.00065	0.000169	0.000128	0.00490	0.00241	0.02049	0.0053
	November	0.919	0.365	0.012	0.011	0.002	0.090	0.00246	0.0015	0.00130	0.1787	0.000021	0.00121	0.00013	0.00108	0.073	0.00102	0.0000052	0.00873	0.00314	0.00056	0.000121	0.000092	0.00345	0.00169	0.01431	0.0042
	December	0.576	0.185	0.008	0.010	0.001	0.050	0.00123	0.0012	0.00065	0.0884	0.000016	0.00070	0.00009	0.00084	0.058	0.00050	0.0000038	0.00426	0.00164	0.00044	0.000066	0.000049	0.00173	0.00082	0.00700	0.0029
Post-closure	January	0.021	0.065	0.005	0.011	0.001	0.013	0.00007	0.0007	0.00005	0.0050	0.000006	0.00025	0.00005	0.00076	0.040	0.00003	0.0000026	0.00022	0.00035	0.00073	0.000042	0.000019	0.00005	0.00006	0.00026	0.0015
	February	0.021	0.064	0.005	0.011	0.001	0.013	0.00007	0.0007	0.00005	0.0050	0.000006	0.00025	0.00005	0.00076	0.040	0.00003	0.0000026	0.00022	0.00034	0.00073	0.000042	0.000019	0.00005	0.00006	0.00026	0.0015
	March	0.022	0.066	0.005	0.011	0.001	0.013	0.00008	0.0007	0.00005	0.0051	0.000006	0.00025	0.00005	0.00076	0.040	0.00003	0.0000026	0.00022	0.00035	0.00073	0.000043	0.000019	0.00005	0.00006	0.00027	0.0015
	April	0.094	0.029	0.005	0.008	0.001	0.019	0.00008	0.0007	0.00003	0.0051	0.000007	0.00022	0.00005	0.00094	0.049	0.00003	0.0000026	0.00011	0.00044	0.00012	0.000005	0.000017	0.00006	0.00004	0.00027	0.0015
	May	0.099	0.048	0.006	0.008	0.001	0.018	0.00008	0.0007	0.00004	0.0051	0.000007	0.00022	0.00006	0.00094	0.050	0.00003	0.0000026	0.00012	0.00048	0.00015	0.000005	0.000017	0.00006	0.00005	0.00026	0.0015
	June	0.096	0.039	0.005	0.008	0.001	0.018	0.00008	0.0007	0.00004	0.0051	0.000007	0.00021	0.00005	0.00094	0.050	0.00003	0.0000026	0.00012	0.00046	0.00014	0.000005	0.000017	0.00005	0.00004	0.00026	0.0015
	July	0.031	0.037	0.005	0.011	0.001	0.017	0.00007	0.0009	0.00003	0.0050	0.000003	0.00025	0.00005	0.00065	0.042	0.00003	0.0000026	0.00012	0.00029	0.00012	0.000005	0.000005	0.00005	0.00003	0.00026	0.0015
	August	0.033	0.040	0.005	0.011	0.001	0.017	0.00008	0.0009	0.00003	0.0051	0.000003	0.00025	0.00005	0.00065	0.042	0.00003	0.0000026	0.00012	0.00030	0.00012	0.000005	0.000005	0.00006	0.00004	0.00027	0.0015
	September	0.034	0.043	0.005	0.011	0.001	0.017	0.00008	0.0009	0.00003	0.0051	0.000003	0.00025	0.00005	0.00065	0.042	0.00003	0.0000026	0.00012	0.00031	0.00013	0.000005	0.000005	0.00006	0.00004	0.00027	0.0015

Table 6.8-13: Base Case Water Quality Model Results, Node 9

Project Phase	Month	Parameter	Ammonia-N	Nitrate-N	Nitrite-N	Phosphorus	Total Cyanide	Aluminum	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Tungsten	Uranium	Vanadium	Zinc
		WQG PAL	**1.8**	**3**	**0.06**	**0.02**	**0.005**	**0.83**	**0.020**	**0.005**	**0.01100**	**1.50**	**0.0001**	**0.0089**	**0.00078**	**0.005**	**0.3**	**0.00906**	**0.0000260**	**0.073**	**0.025**	**0.1**	**0.00025**	**0.0008**	**0.03000**	**0.005**	**0.12**	**0.011**
	October		0.267	**0.048**	0.006	0.010	0.001	0.014	0.00012	**0.0010**	0.00006	0.0051	0.000012	0.00023	0.00006	0.00063	0.044	0.00003	0.0000026	0.00014	0.00033	0.00031	0.000014	0.000009	**0.00014**	**0.00005**	0.00027	0.0017
	November		0.266	0.040	0.005	0.010	0.001	0.014	0.00012	**0.0010**	0.00006	0.0051	0.000012	0.00023	0.00005	0.00063	0.044	0.00003	0.0000026	0.00014	0.00031	0.00030	0.000014	0.000009	**0.00014**	0.00005	0.00027	0.0017
	December		0.263	0.031	0.005	0.010	0.001	0.013	0.00011	**0.0010**	0.00006	0.0050	0.000012	0.00023	0.00005	0.00063	0.044	0.00003	0.0000026	0.00013	0.00028	0.00029	0.000014	0.000009	**0.00014**	0.00004	0.00026	0.0017

Notes:

All units are mg/L

Water quality model results summarized in this table are Base Case (Expected Case); results of model sensitivity cases are presented in Appendix N-2

WQG PAL (long-term exposure) are identified in Table 6.6-3.

As applicable, numerical guideline values were calculated using the most conservative approach (i.e., 25th percentile baseline values for ameliorating factors, save for zinc, which uses 75th percentile pH for the FEQG calculation). For Birch Lake these data were as follows:

	25th	75th
pH	7.4	7.6
Hardness (mg/L)	28	
Dissolved organic carbon (DOC) (mg/L)	8.1	
Chloride (mg/L)	0.25	
Alkalinity (mg/L)	28	

Only model results for parameters with WQG PAL are summarized here; results for all modelled parameters are presented in Appendix N-2.

Grey shaded values are greater than water quality guidelines (none).

Bolded purple values were determined to be measurably different than existing conditions (15% or greater change relative to baseline conditions).

Table 6.8-14: Base Case Water Quality Model Results, Node 10

Project Phase	Month	Parameter	Ammonia-N	Nitrate-N	Nitrite-N	Phosphorus	Total Cyanide	Aluminum	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Tungsten	Uranium	Vanadium	Zinc
		WQG PAL	1.8	3	0.06	0.02	0.005	0.83	0.020	0.005	0.01100	1.50	0.0001	0.0089	0.00078	0.005	0.3	0.00906	0.000026	0.073	0.025	0.1	0.00025	0.0008	0.03000	0.005	0.12	0.011
Existing condition	January		0.008	0.067	0.005	0.009	0.001	0.014	0.00010	0.0007	0.00006	0.0050	0.000008	0.00025	0.00005	0.00076	0.039	0.00003	0.0000050	0.0002	0.00762	0.00100	0.00005	0.000028	0.00005	0.00005	0.00088	0.0015
	February		0.008	0.067	0.005	0.009	0.001	0.014	0.00010	0.0007	0.00006	0.0050	0.000008	0.00025	0.00005	0.00076	0.039	0.00003	0.0000050	0.0002	0.00762	0.00100	0.00005	0.000028	0.00005	0.00005	0.00088	0.0015
	March		0.008	0.067	0.005	0.009	0.001	0.014	0.00010	0.0007	0.00006	0.0050	0.000008	0.00025	0.00005	0.00076	0.039	0.00003	0.0000050	0.0002	0.00762	0.00100	0.00005	0.000028	0.00005	0.00005	0.00088	0.0015
	April		0.141	0.017	0.005	0.013	0.001	0.032	0.00010	0.0007	0.00006	0.0050	0.000002	0.00025	0.00005	0.00085	0.055	0.00003	0.0000050	0.0001	0.00394	0.00009	0.00000	0.000005	0.00005	0.00002	0.00025	0.0015
	May		0.141	0.017	0.005	0.013	0.001	0.032	0.00010	0.0007	0.00006	0.0050	0.000002	0.00025	0.00005	0.00085	0.055	0.00003	0.0000050	0.0001	0.00025	0.00009	0.00000	0.000005	0.00005	0.00002	0.00025	0.0015
	June		0.141	0.017	0.005	0.013	0.001	0.032	0.00010	0.0007	0.00006	0.0050	0.000002	0.00025	0.00005	0.00085	0.055	0.00003	0.0000050	0.0001	0.00025	0.00009	0.00000	0.000005	0.00005	0.00002	0.00025	0.0015
	July		0.030	0.037	0.005	0.010	0.001	0.016	0.00010	0.0008	0.00006	0.0050	0.000002	0.00025	0.00005	0.00064	0.045	0.00003	0.0000050	0.0001	0.00025	0.00009	0.00000	0.000005	0.00005	0.00002	0.00025	0.0015
	August		0.030	0.037	0.005	0.010	0.001	0.016	0.00010	0.0008	0.00006	0.0050	0.000002	0.00025	0.00005	0.00064	0.045	0.00003	0.0000050	0.0001	0.00025	0.00009	0.00000	0.000005	0.00005	0.00002	0.00025	0.0015
	September		0.030	0.037	0.005	0.010	0.001	0.016	0.00010	0.0008	0.00006	0.0050	0.000002	0.00025	0.00005	0.00064	0.045	0.00003	0.0000050	0.0001	0.00025	0.00009	0.00000	0.000005	0.00005	0.00002	0.00025	0.0015
	October		0.488	0.030	0.005	0.015	0.001	0.015	0.00010	0.0009	0.00006	0.0050	0.000026	0.00025	0.00005	0.00061	0.054	0.00003	0.0000050	0.0001	0.00025	0.00054	0.00003	0.000005	0.00005	0.00003	0.00025	0.0020
	November		0.488	0.030	0.005	0.015	0.001	0.015	0.00010	0.0009	0.00006	0.0050	0.000026	0.00025	0.00005	0.00061	0.054	0.00003	0.0000050	0.0001	0.00025	0.00054	0.00003	0.000005	0.00005	0.00003	0.00025	0.0020
	December		0.488	0.030	0.005	0.015	0.001	0.015	0.00010	0.0009	0.00006	0.0050	0.000026	0.00025	0.00005	0.00061	0.054	0.00003	0.0000050	0.0001	0.00025	0.00054	0.00003	0.000005	0.00005	0.00003	0.00025	0.0020
Construction	January		0.017	0.057	0.005	0.011	0.001	0.012	0.00010	0.0007	0.00006	0.0050	0.000006	0.00025	0.00005	0.00075	0.040	0.00003	0.0000050	0.0002	0.00060	0.00072	0.00004	0.000019	0.00005	0.00005	0.00027	0.0015
	February		0.037	0.052	0.005	0.011	0.001	0.012	0.00010	0.0007	0.00006	0.0050	0.000005	0.00025	0.00005	0.00076	0.040	0.00003	0.0000050	0.0002	0.00055	0.00062	0.00004	0.000017	0.00005	0.00004	0.00027	0.0015
	March		0.037	0.052	0.005	0.011	0.001	0.012	0.00010	0.0007	0.00006	0.0050	0.000005	0.00025	0.00005	0.00076	0.040	0.00003	0.0000050	0.0002	0.00055	0.00062	0.00004	0.000017	0.00005	0.00004	0.00027	0.0015
	April		0.098	0.015	0.005	0.009	0.001	0.018	0.00010	0.0007	0.00006	0.0050	0.000006	0.00025	0.00005	0.00090	0.047	0.00003	0.0000050	0.0001	0.00037	0.00010	0.00001	0.000014	0.00005	0.00002	0.00025	0.0015
	May		0.099	0.015	0.005	0.009	0.001	0.018	0.00010	0.0007	0.00006	0.0050	0.000006	0.00025	0.00005	0.00090	0.047	0.00003	0.0000050	0.0001	0.00037	0.00010	0.00001	0.000014	0.00005	0.00002	0.00025	0.0015
	June		0.099	0.015	0.005	0.009	0.001	0.018	0.00010	0.0007	0.00006	0.0050	0.000006	0.00025	0.00005	0.00090	0.047	0.00003	0.0000050	0.0001	0.00037	0.00010	0.00001	0.000014	0.00005	0.00002	0.00025	0.0015
	July		0.045	0.022	0.005	0.011	0.001	0.016	0.00010	0.0008	0.00006	0.0050	0.000002	0.00025	0.00005	0.00067	0.041	0.00003	0.0000050	0.0001	0.00025	0.00010	0.00001	0.000005	0.00005	0.00002	0.00025	0.0015
	August		0.036	0.021	0.005	0.011	0.001	0.016	0.00010	0.0008	0.00006	0.0050	0.000002	0.00025	0.00005	0.00066	0.042	0.00003	0.0000050	0.0001	0.00025	0.00010	0.00001	0.000005	0.00005	0.00002	0.00025	0.0015
	September		0.027	0.021	0.005	0.010	0.001	0.016	0.00010	0.0008	0.00006	0.0050	0.000002	0.00025	0.00005	0.00065	0.042	0.00003	0.0000050	0.0001	0.00025	0.00010	0.00001	0.000005	0.00005	0.00002	0.00025	0.0015
	October		0.250	0.018	0.005	0.010	0.001	0.013	0.00010	0.0010	0.00006	0.0050	0.000011	0.00025	0.00005	0.00063	0.045	0.00003	0.0000050	0.0001	0.00025	0.00027	0.00001	0.000009	0.00005	0.00002	0.00025	0.0017
	November		0.250	0.018	0.005	0.010	0.001	0.013	0.00010	0.0010	0.00006	0.0050	0.000011	0.00025	0.00005	0.00062	0.045	0.00003	0.0000050	0.0001	0.00025	0.00027	0.00001	0.000009	0.00005	0.00002	0.00025	0.0017
	December		0.250	0.018	0.005	0.010	0.001	0.013	0.00010	0.0010	0.00006	0.0050	0.000012	0.00025	0.00005	0.00062	0.045	0.00003	0.0000050	0.0001	0.00025	0.00027	0.00001	0.000009	0.00005	0.00002	0.00025	0.0017
Operations	January		0.017	0.059	0.005	0.011	0.001	0.013	0.00012	0.0007	0.00007	0.0053	0.000006	0.00025	0.00006	0.00076	0.042	0.00003	0.0000050	0.0003	0.00065	0.00073	0.00004	0.000020	0.00005	0.00007	0.00046	0.0015
	February		0.017	0.059	0.005	0.011	0.001	0.013	0.00014	0.0007	0.00007	0.0054	0.000006	0.00026	0.00006	0.00076	0.043	0.00003	0.0000050	0.0004	0.00066	0.00073	0.00004	0.000020	0.00005	0.00007	0.00051	0.0015
	March		0.017	0.060	0.005	0.011	0.001	0.013	0.00015	0.0007	0.00008	0.0055	0.000006	0.00026	0.00006	0.00076	0.043	0.00003	0.0000050	0.0004	0.00067	0.00073	0.00004	0.000020	0.00005	0.00007	0.00057	0.0015
	April		0.089	0.016	0.005	0.008	0.001	0.019	0.00016	0.0007	0.00006	0.0056	0.000007	0.00025	0.00006	0.00094	0.053	0.00003	0.00002	0.0003	0.00046	0.00011	0.00001	0.000017	0.00005	0.00004	0.00057	0.0015
	May		0.089	0.015	0.005	0.008	0.001	0.019	0.00013	0.0007	0.00005	0.0054	0.000007	0.00025	0.00006	0.00093	0.052	0.00003	0.0000050	0.0002	0.00043	0.00011	0.00001	0.000016	0.00005	0.00004	0.00047	0.0015
	June		0.089	0.015	0.005	0.008	0.001	0.026	0.00077	0.0009	0.00040	0.0117	0.000009	0.00047	0.00007	0.00106	0.083	0.00015	0.0000028	0.0026	0.00123	0.00018	0.00004	0.000016	0.00005	0.00020	0.00434	0.0021
	July		0.025	0.023	0.005	0.011	0.001	0.032	0.00146	0.0011	0.00078	0.0185	0.000006	0.00077	0.00009	0.00092	0.109	0.00028	0.0000031	0.0052	0.00195	0.00025	0.00007	0.000005	0.00005	0.00037	0.00855	0.0027
	August		0.026	0.024	0.005	0.011	0.001	0.037	0.00193	0.0012	0.00102	0.0229	0.000007	0.00094	0.00011	0.00101	0.130	0.00036	0.0000033	0.0068	0.00251	0.00030	0.00010	0.000005	0.00005	0.00048	0.01127	0.0031
	September		0.026	0.024	0.005	0.011	0.001	0.036	0.00188	0.0012	0.00100	0.0225	0.000007	0.00093	0.00011	0.00100	0.128	0.00035	0.0000033	0.0067	0.00246	0.00030	0.00009	0.000005	0.00005	0.00047	0.01103	0.0031
	October		0.250	0.021	0.005	0.011	0.001	0.035	0.00213	0.0014	0.00114	0.0246	0.000017	0.00099	0.00011	0.00102	0.141	0.00039	0.0000034	0.0075	0.00272	0.00049	0.00011	0.000009	0.00014	0.00053	0.01231	0.0035
	November		0.250	0.020	0.005	0.010	0.001	0.020	0.00079	0.0011	0.00041	0.0114	0.000013	0.00047	0.00007	0.00075	0.076	0.00014	0.0000028	0.0025	0.00105	0.00035	0.00005	0.000009	0.00014	0.00020	0.00417	0.0023
	December		0.250	0.019	0.005	0.010	0.001	0.013	0.00014	0.0010	0.00007	0.0053	0.000012	0.00023	0.00005	0.00063	0.046	0.00003	0.0000050	0.0002	0.00028	0.00028	0.00002	0.000009	0.00014	0.00003	0.00040	0.0017
Active closure	January		0.120	0.111	0.006	0.011	0.001	0.024	0.00045	0.0008	0.00024	0.0321	0.000007	0.00040	0.00007	0.00082	0.045	0.00018	0.0000029	0.0016	0.00106	0.00075	0.00006	0.000032	0.00057	0.00032	0.00247	0.0019
	February		0.063	0.081	0.005	0.011	0.001	0.018	0.00026	0.0007	0.00014	0.0172	0.000006	0.00031	0.00006	0.00079	0.042	0.00009	0.0000027	0.0008	0.00081	0.00075	0.00005	0.000025	0.00028	0.00018	0.00126	0.0016
	March		0.126	0.114	0.006	0.011	0.001	0.025	0.00048	0.0008	0.00025	0.0338	0.000007	0.00041	0.00007	0.00083	0.045	0.00019	0.0000030	0.0016	0.00108	0.00078	0.00006	0.000033	0.00060	0.00033	0.00260	0.0019
	April		0.368	0.160	0.008	0.008	0.001	0.051	0.00108	0.0009	0.00056	0.0784	0.000011	0.00062	0.00009	0.00112	0.062	0.00044	0.0000037	0.0037	0.00161	0.00024	0.00005	0.000051	0.00145	0.00073	0.00619	0.0025
	May		1.308	0.653	0.017	0.010	0.003	0.160	0.00436	0.0017	0.00232	0.3254	0.000024	0.00203	0.00019	0.00177	0.102	0.00186	0.0000075	0.0160	0.00572	0.00056	0.00021	0.000169	0.00615	0.00308	0.02618	0.0061
	June		0.821	0.397	0.012	0.009	0.002	0.103	0.00265	0.0013	0.00141	0.1973	0.000017	0.00130	0.00014	0.00143	0.081	0.00112	0.0000055	0.0096	0.00359	0.00038	0.00013	0.000108	0.00372	0.00186	0.01582	0.0042
	July		0.568	0.306	0.010	0.011	0.002	0.079	0.00199	0.0013	0.00105	0.1477	0.000010	0.00105	0.00011	0.00103	0.066	0.00084	0.0000047	0.0072	0.00263	0.00030	0.00010	0.000073	0.00277	0.00138	0.01180	0.0035
	August		0.751	0.402	0.012	0.011	0.002	0.101	0.00265	0.0014	0.00139	0.1957	0.000012	0.00133	0.00014	0.00115	0.074	0.00111	0.0000055	0.0096	0.00343	0.00037	0.00013	0.000096	0.00369	0.00184	0.01569	0.0042
	September		0.880	0.470	0.013	0.012	0.002	0.116	0.00309	0.0015	0.00164	0.2295	0.000014	0.00152	0.00015	0.00124	0.079	0.00131	0.0000060	0.0112	0.00399	0.00042	0.00015	0.000112	0.00433	0.00216	0.01842	0.0047
	October		1.164	0.498	0.014	0.011	0.002	0.119	0.00335	0.0017	0.00177	0.2455	0.000024	0.00159	0.00016	0.00126	0.084	0.00140	0.0000063	0.0120	0.00426	0.00061	0.00017	0.000124	0.00472	0.00232	0.01972	0.0051
	November		0.885	0.352	0.011	0.011	0.002	0.087	0.00236	0.0015	0.00125	0.1720	0.000020	0.00117	0.00013	0.00106	0.072	0.00098	0.0000051	0.0084	0.00303	0.00052	0.00012	0.000089	0.00332	0.00162	0.01377	0.0041
	December		0.555	0.178	0.008	0.011	0.001	0.049	0.00118	0.0012	0.00063	0.0852	0.000016	0.00068	0.00009	0.00083	0.058	0.00048	0.0000038	0.0041	0.00159	0.00040	0.00007	0.000047	0.00166	0.00079	0.00674	0.0028
Post-closure	January		0.020	0.058	0.005	0.011	0.001	0.013	0.00007	0.0007	0.00005	0.0050	0.000007	0.00025	0.00005	0.00075	0.041	0.00003	0.0000026	0.0002	0.00034	0.00072	0.00004	0.000019	0.00006	0.00006	0.00026	0.0015
	February		0.020	0.057	0.005	0.011	0.001	0.013	0.00007	0.0007	0.00005	0.0050	0.000006	0.00025	0.00005	0.00076	0.041	0.00003	0.0000026	0.0002	0.00034	0.00074	0.00004	0.000019	0.00005	0.00006	0.00026	0.0015
	March		0.021	0.060	0.005	0.011	0.001	0.013	0.00007	0.0007	0.00005	0.0051	0.000006	0.00025	0.00005	0.00076	0.041	0.00003	0.0000026	0.0002	0.00035	0.00074	0.00004	0.000019	0.00005	0.00006	0.00027	0.0015
	April		0.096	0.026	0.005	0.008	0.001	0.019	0.00008	0.0007	0.00003	0.0051	0.000007	0.00022	0.00005	0.00093	0.049	0.00003	0.0000026	0.0001	0.00043	0.00016	0.00001	0.000017	0.00006	0.00004	0.00027	0.0015
	May		0.101	0.042	0.006	0.008	0.001	0.018	0.00008	0.0007	0.00003	0.0051	0.000007	0.00022	0.00006	0.00093	0.050	0.00003	0.0000026	0.0001	0.00047	0.00015	0.00001	0.000016	0.00006	0.00005	0.00026	0.0015
	June		0.098	0.034	0.005	0.008	0.001	0.019	0.00008	0.0007	0.00003	0.0051	0.000007	0.00021	0.00005	0.00093	0.050	0.00003	0.0000026	0.0001	0.00045	0.00014	0.00001	0.000016	0.00005	0.00004	0.00026	0.0015
	July		0.031	0.032	0.005	0.011	0.001	0.017	0.00007	0.0009	0.00003	0.0050	0.000003	0.00025	0.00005	0.00066	0.042	0.00003	0.0000026	0.0001	0.00029	0.00012	0.00001	0.000005	0.00005	0.00003	0.00026	0.0015

Table 6.8-14: Base Case Water Quality Model Results, Node 10

Project Phase	Month	Parameter	Ammonia-N	Nitrate-N	Nitrite-N	Phosphorus	Total Cyanide	Aluminum	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Tungsten	Uranium	Vanadium	Zinc
		WQG PAL	**1.8**	**3**	**0.06**	**0.02**	**0.005**	**0.83**	**0.020**	**0.005**	**0.01100**	**1.50**	**0.0001**	**0.0089**	**0.00078**	**0.005**	**0.3**	**0.00906**	**0.000026**	**0.073**	**0.025**	**0.1**	**0.00025**	**0.0008**	**0.03000**	**0.005**	**0.12**	**0.011**
	August		0.033	0.035	0.005	0.011	0.001	0.017	0.00008	0.0009	0.00003	0.0051	0.000003	0.00025	0.00005	0.00065	0.042	0.00003	0.0000026	0.0001	**0.00030**	**0.00012**	0.00001	0.000005	0.00006	**0.00004**	0.00027	0.0015
	September		0.033	0.038	0.005	0.011	0.001	0.017	0.00008	0.0009	0.00003	0.0051	0.000003	0.00025	0.00005	0.00065	0.042	0.00003	0.0000026	0.0001	**0.00030**	**0.00013**	0.00001	0.000005	0.00006	**0.00004**	0.00027	0.0015
	October		0.258	**0.040**	0.006	0.010	0.001	0.014	**0.00012**	0.0010	0.00006	0.0051	0.000012	0.00023	0.00006	0.00063	0.045	0.00003	0.0000026	0.0001	**0.00032**	0.00030	0.00001	**0.000009**	0.00014	**0.00005**	0.00027	0.0017
	November		0.257	0.030	0.005	0.010	0.001	0.014	**0.00012**	0.0010	0.00006	0.0051	0.000013	0.00023	0.00005	0.00063	0.045	0.00003	0.0000026	0.0001	**0.00031**	0.00031	0.00001	**0.000010**	0.00015	**0.00005**	0.00027	0.0017
	December		0.254	0.027	0.005	0.010	0.001	0.014	0.00011	0.0010	0.00006	0.0050	0.000013	0.00023	0.00005	0.00063	0.045	0.00003	0.0000026	0.0001	0.00028	0.00030	0.00001	**0.000009**	0.00015	0.00004	0.00026	0.0017

Notes:

All units are mg/L

Water quality model results summarized in this table are Base Case (Expected Case); results of model sensitivity cases are presented in Appendix N-2

WQG PAL (long-term exposure) are identified in Table 6.6-3.

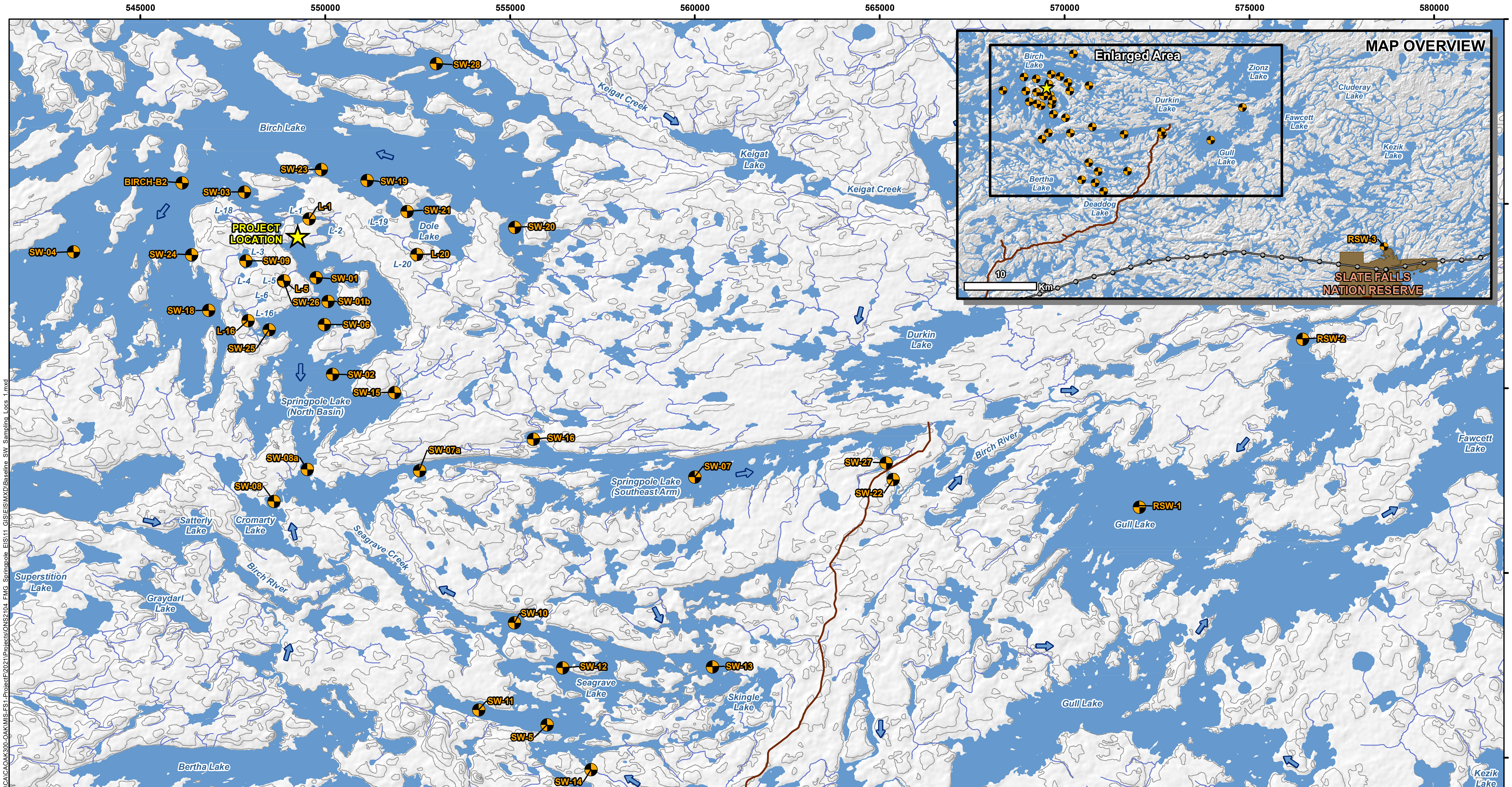
As applicable, numerical guideline values were calculated using the most conservative approach (i.e., 25th percentile baseline values for ameliorating factors, save for zinc, which uses 75th percentile pH for the FEQG calculation). For Birch Lake these data were as follows:

	25th	75th
pH	7.4	7.6
Hardness (mg/L)	28	
Dissolved organic carbon (DOC) (mg/L)	8.1	
Chloride (mg/L)	0.25	
Alkalinity (mg/L)	28	

Only model results for parameters with WQG PAL are summarized here; results for all modelled parameters are presented in Appendix N-2.

Grey shaded values are greater than water quality guidelines (none).

Bolded purple values were determined to be measurably different than existing conditions (15% or greater change relative to baseline conditions).



LEGEND

- Project Location
- Baseline Water Quality Monitoring Stations (Labelled with ID)
- First Nation Reserve
- Existing Road
- Existing Transmission Line
- Contour (10 m intervals)
- Watercourse
- Waterbody
- Flow Direction

NOTES:
- Topographic information extracted from LIO, MNRF.

Datum: NAD83
Projection: UTM Zone 15N

FIRST MINING GOLD

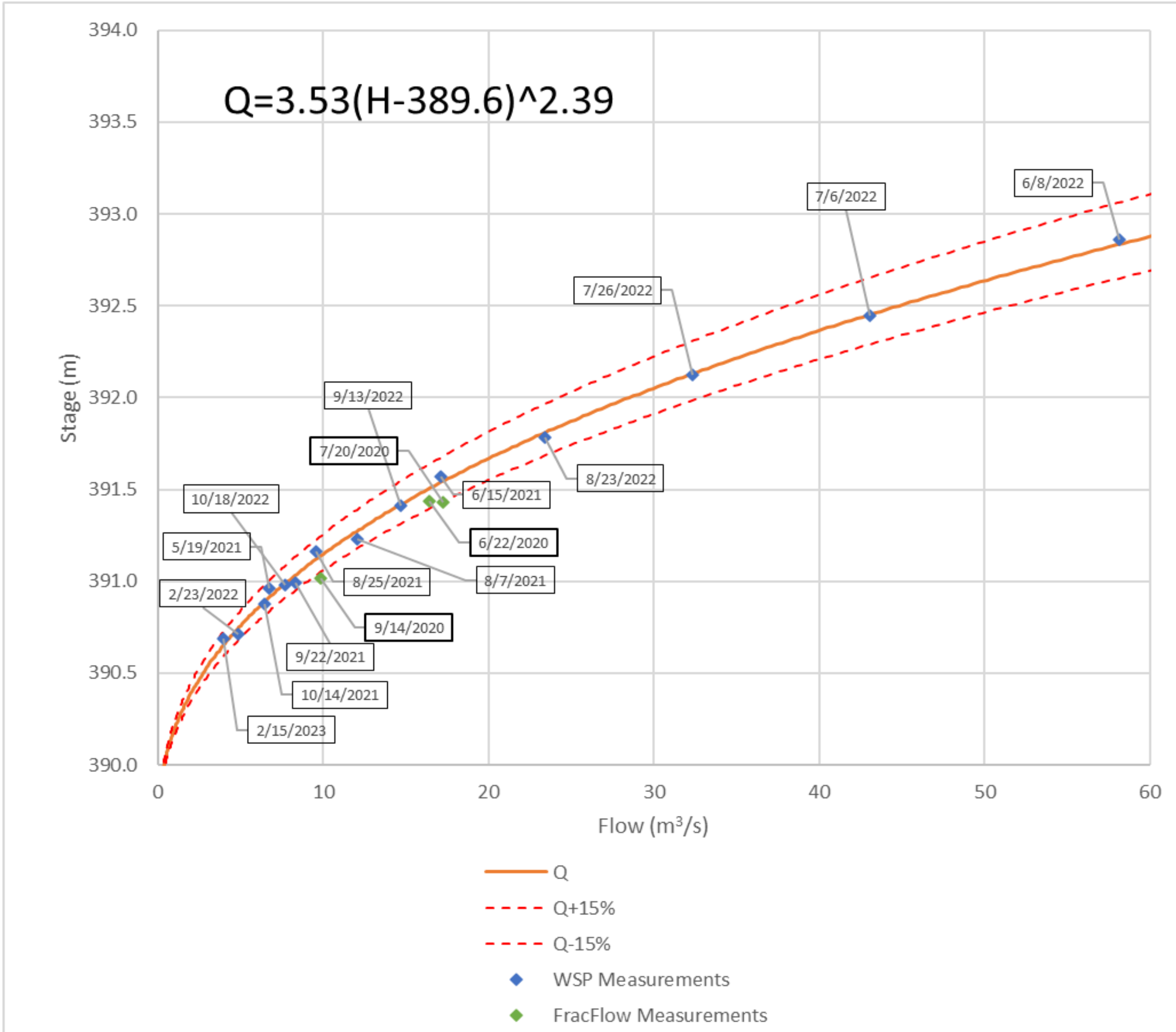
wsp

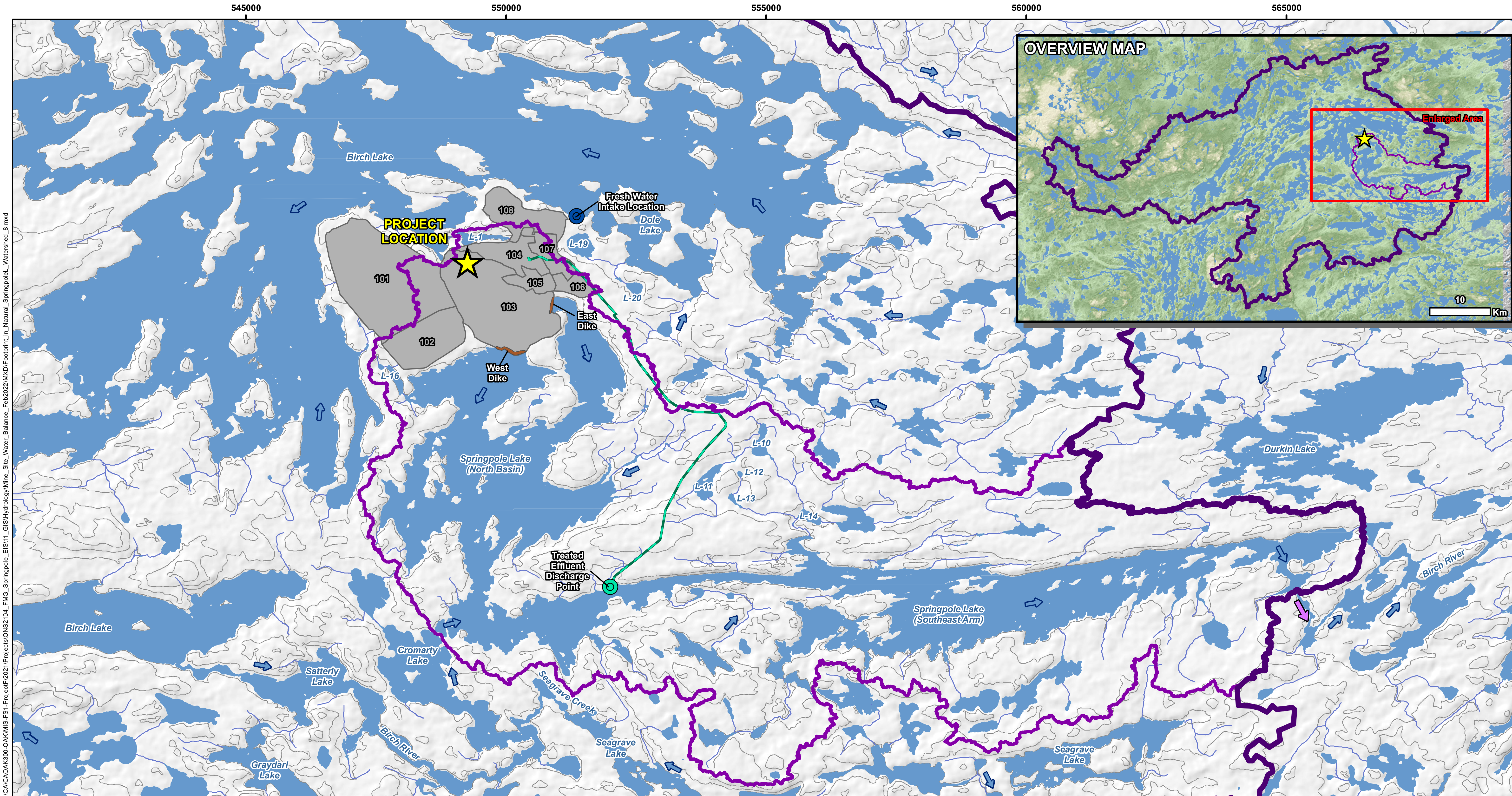
SPRINGPOLE GOLD PROJECT

Baseline Water Quality Monitoring Stations

PROJECT N°: ONS2104	FIGURE: 6.8-1
SCALE: 1:97,500	DATE: October 2024

Figure 6.8-2: Springpole Lake, Stage-Discharge Curve





LEGEND

- Project Location
- Fresh Water Intake Location
- Treated Effluent Discharge Point
- Effluent Discharge Pipeline
- Contour (10 m intervals)
- Watercourse
- Waterbody
- Flow Direction
- Watershed Outlet Flow Direction
- Cumulative Watershed to Springpole Lake Oulet
- Pre-developement Springpole Lake Subwatershed
- Project Watersheds (Labelled with ID)
- Dike

0 1 2 4 6 8 10 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Watershed delineations based on data provided by Aquaspheara, data obtained through the Ontario Flow Assessment Tool (OFAT) and LiDAR provided by First Mining Gold, 2020.

Datum: NAD83
Projection: UTM Zone 15N

FIRST MINING GOLD | wsp

SPRINGPOLE GOLD PROJECT

Treated Effluent Discharge Location, Springpole Lake (Southeast Arm)

PROJECT Nº: ONS2104	**FIGURE: 6.8-3**
SCALE: 1:70,000	DATE: December 2023

Figure 6.8-4: Treated Effluent Discharge Volume, Operations

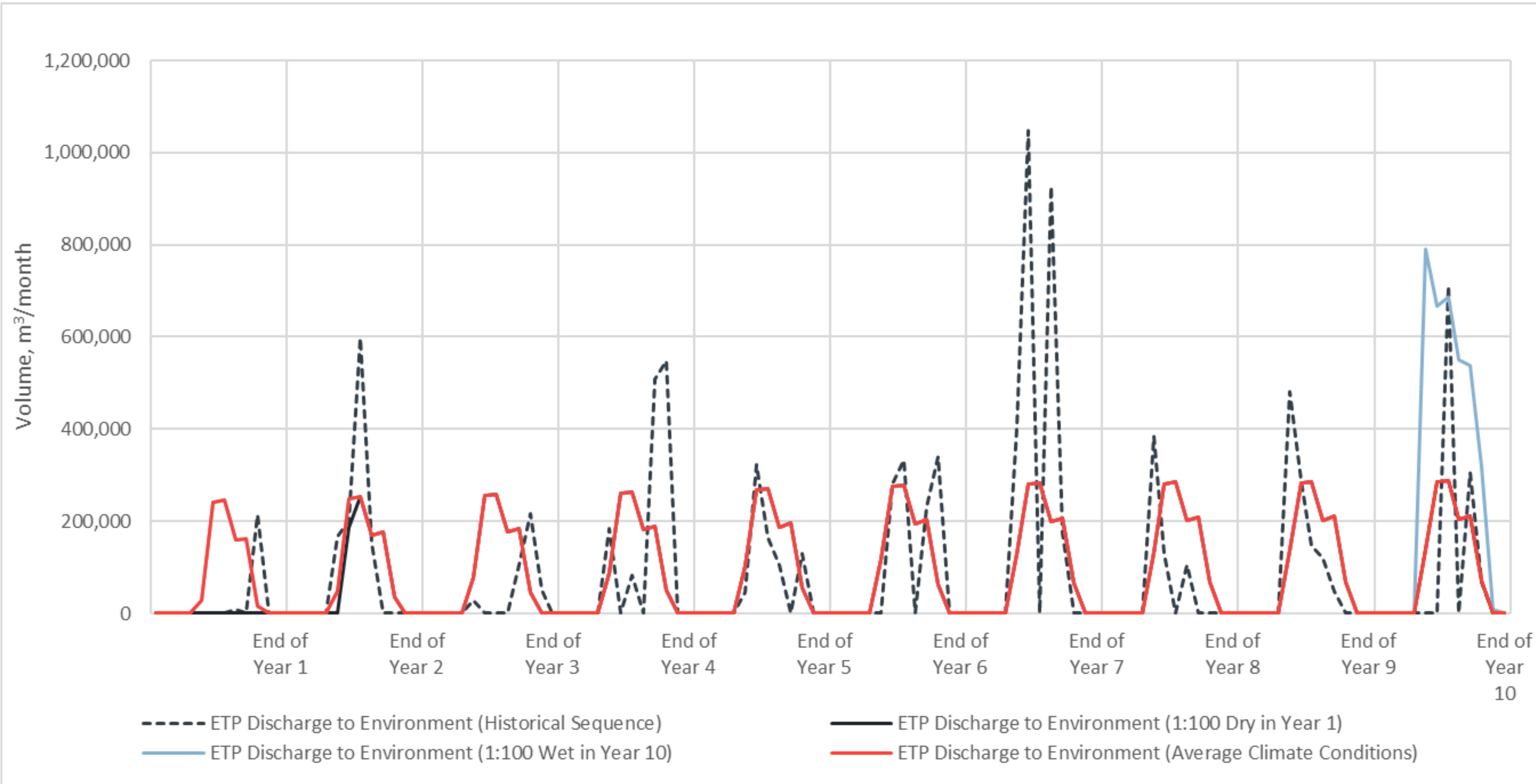


Figure 6.8-5: Treated Effluent Discharge Volume, Active Closure

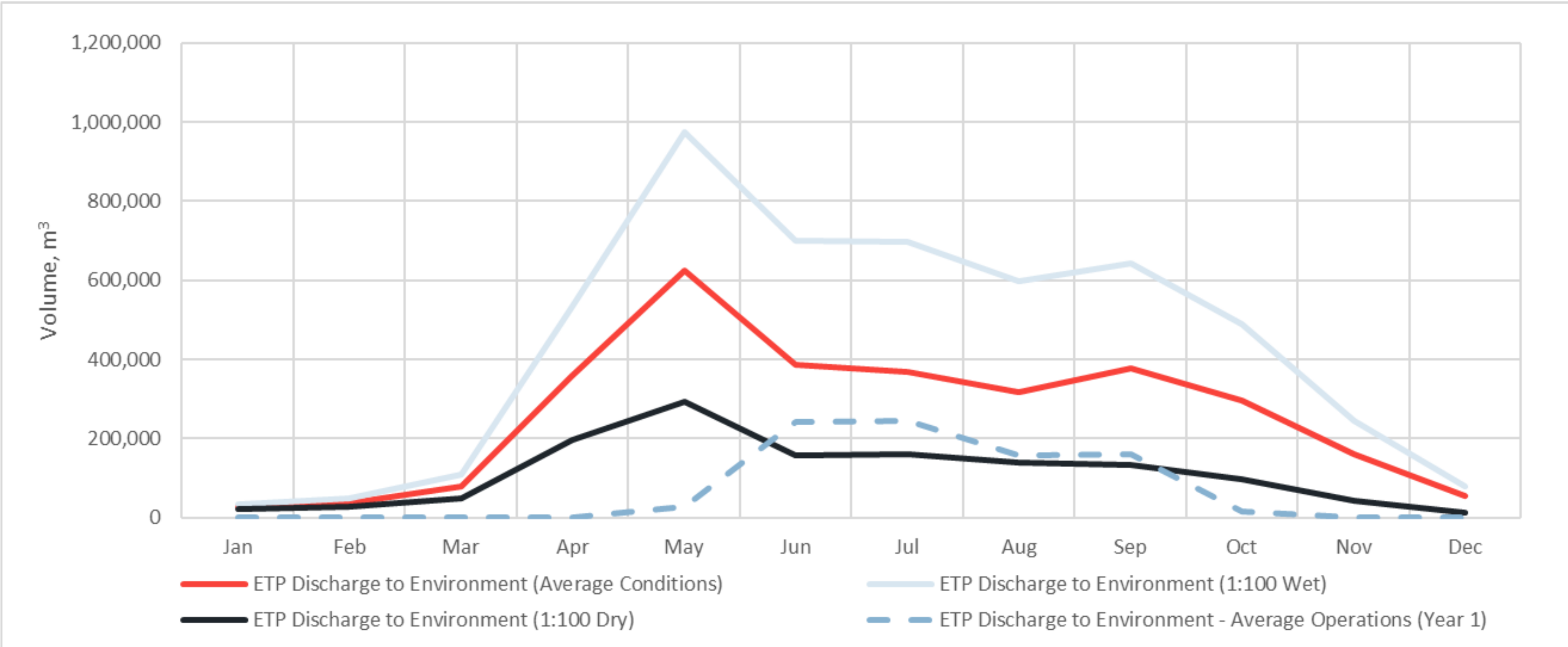


Figure 6.8-6: Springpole Lake, Southeast Arm Water Quality, Discharge Location (operations)

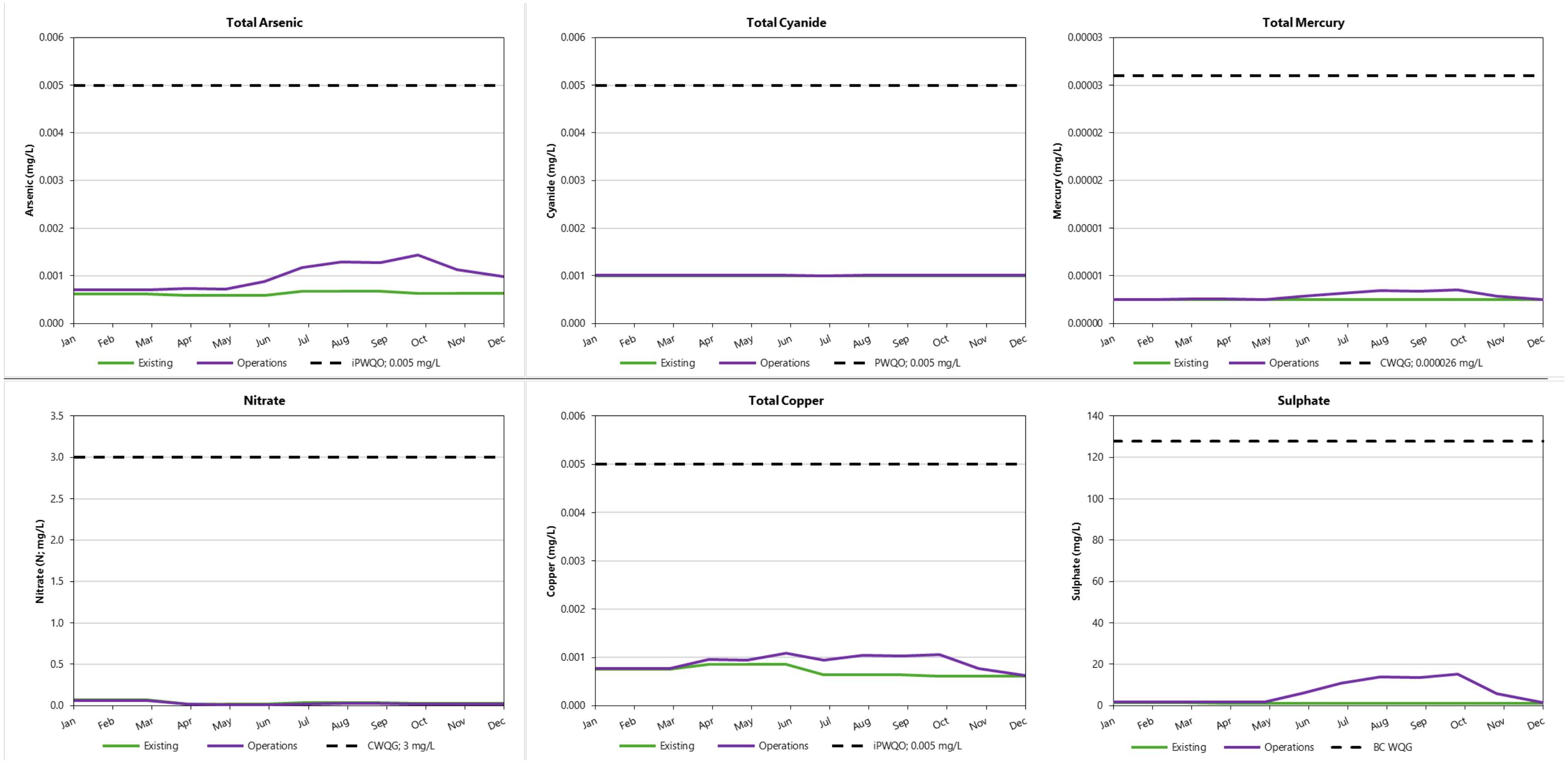


Figure 6.8-7: Springpole Lake, Southeast Arm Water Quality, Discharge Location (post-closure)

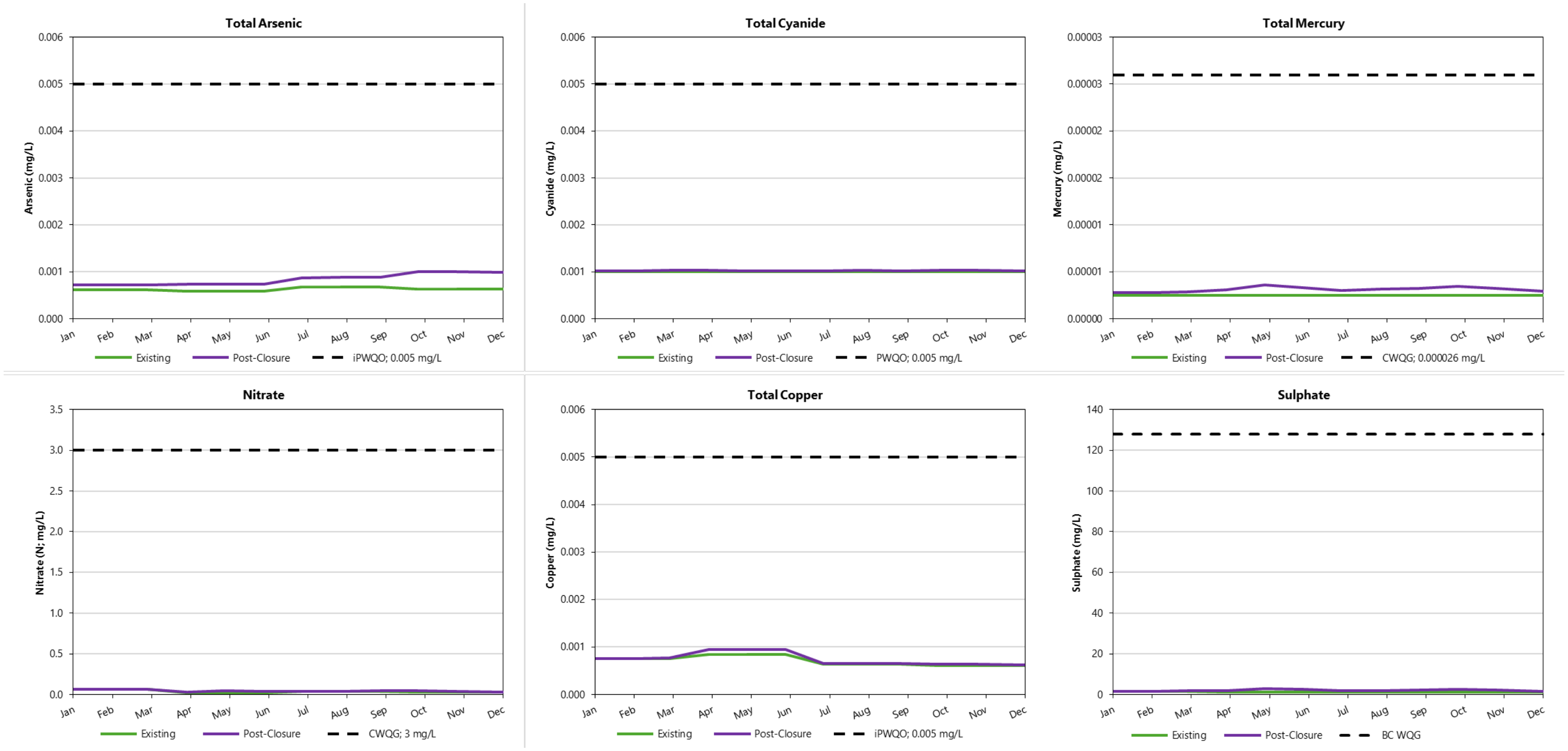


Figure 6.8-8: Springpole Lake, Southeast Arm Water Quality, Node 9 (operations)

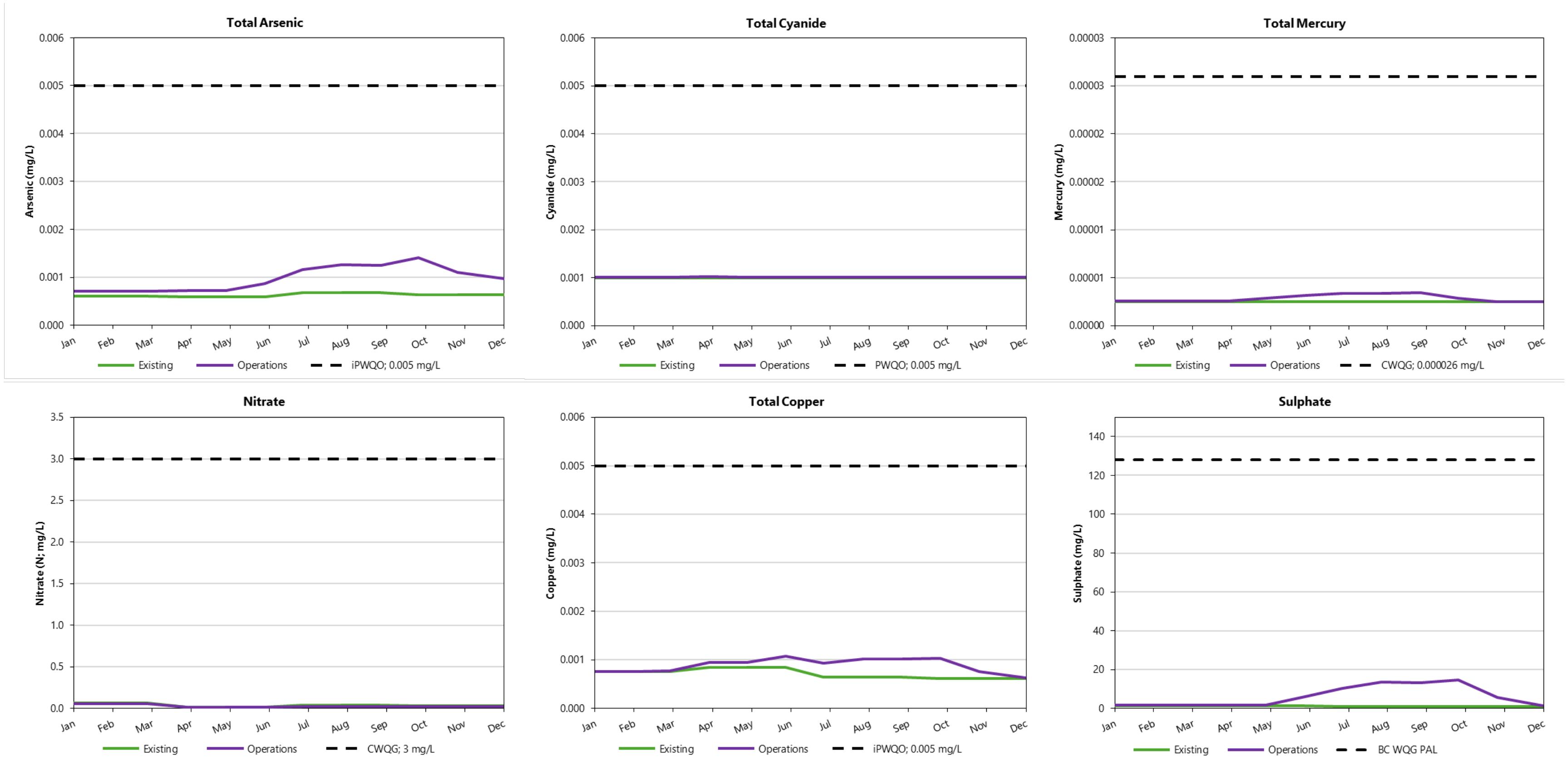


Figure 6.8-9: Springpole Lake, Southeast Arm Water Quality, Node 9 (post-closure)

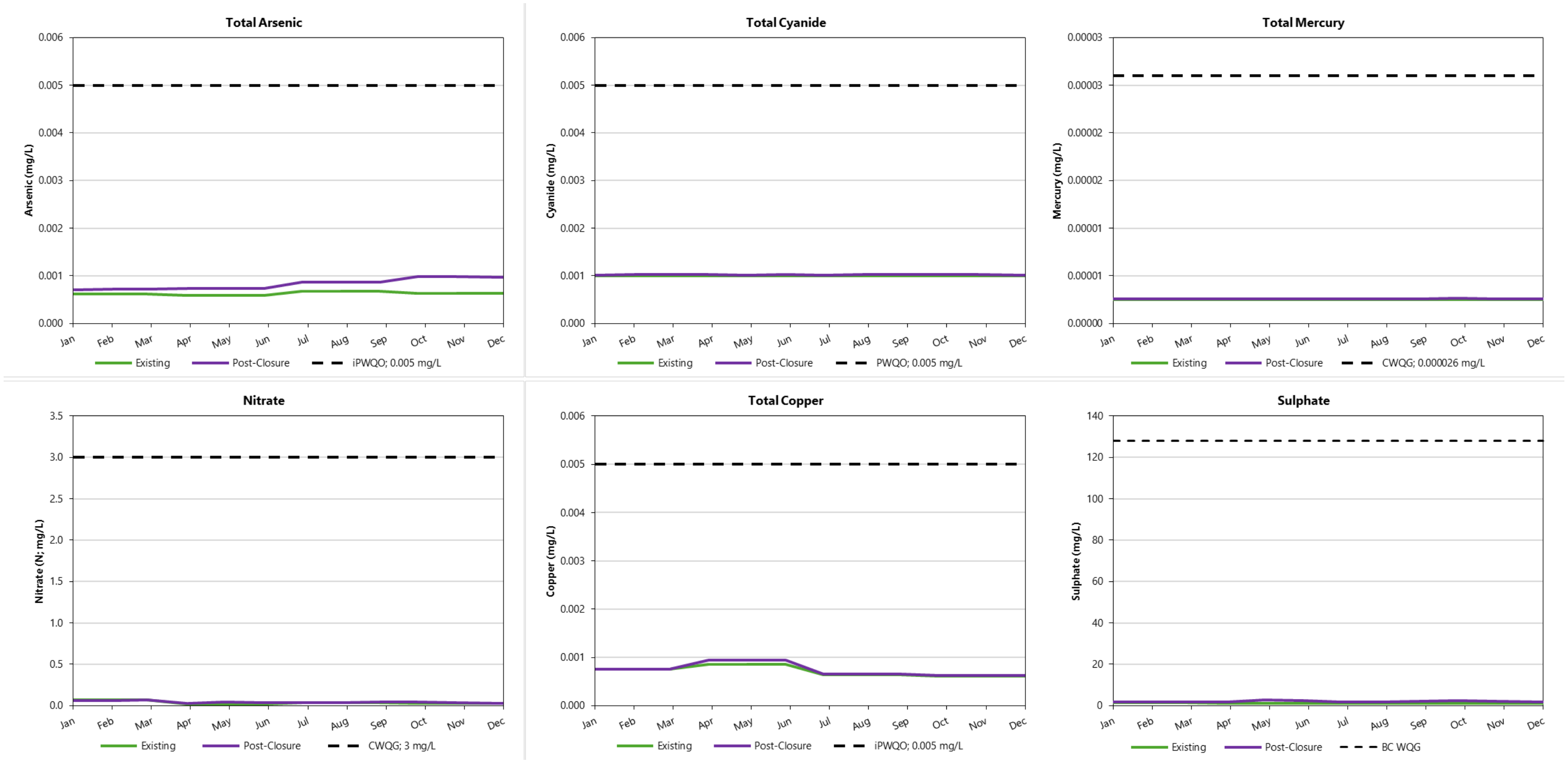


Figure 6.8-10: Springpole Lake, Southeast Arm Water Quality, Node 10 (operations)

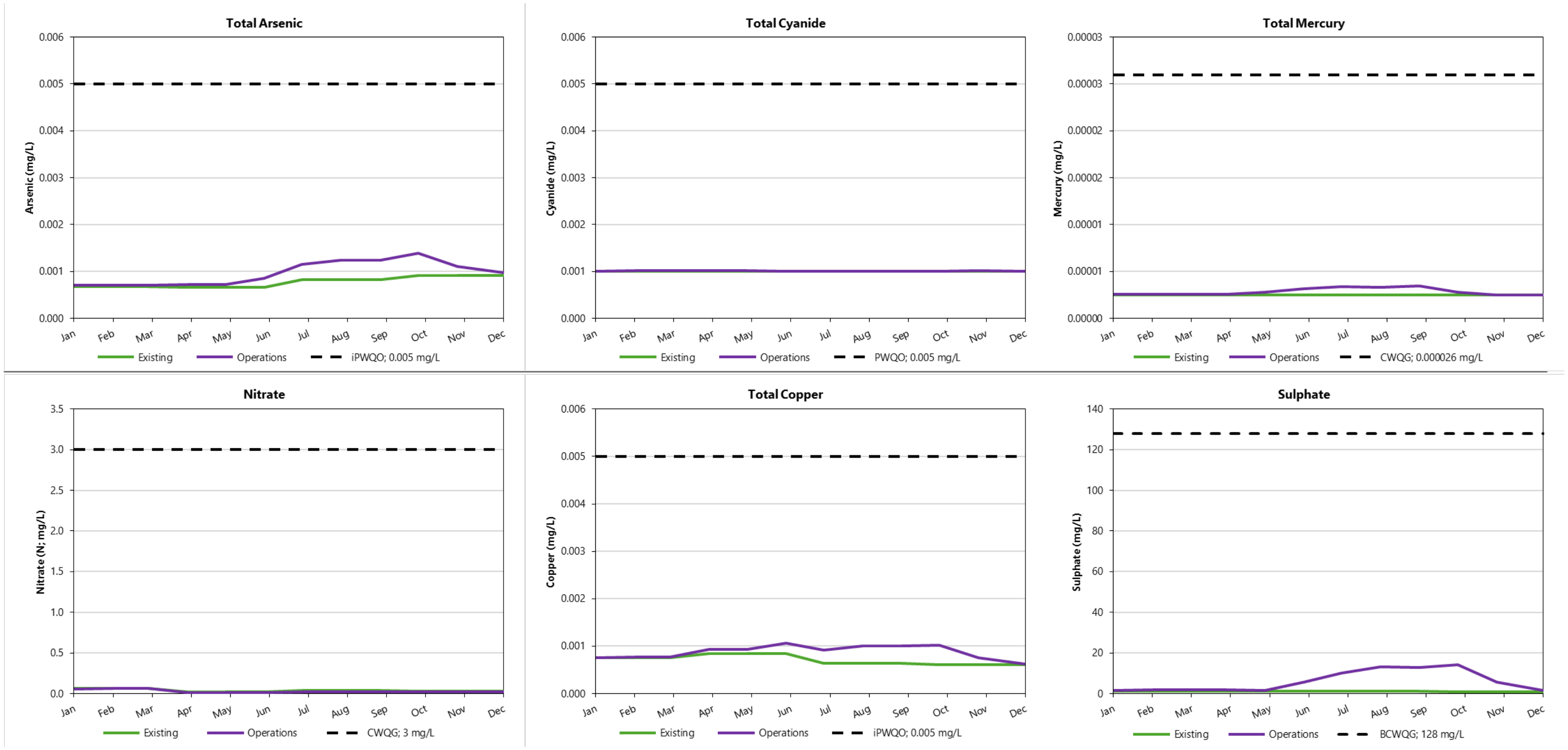


Figure 6.8-11: Springpole Lake, Southeast Arm Water Quality, Node 10 (post-closure)